JUNE 2002

C-9 (SNAKE CREEK CANAL)

INTEGRATED ECOSYSTEM RESTORATION REPORT and ENVIRONMENTAL ASSESSMENT

DADE COUNTY, FLORIDA

US Army Corps
of Engineers®
Jacksonville District
South Atlantic Division

Canal 9 (Snake Creek Canal)
Dade County, Florida

Section 1135 Project Modification for Improvements to the Environment

INTEGRATED ECOSYSTEM RESTORATION REPORT
and
ENVIRONMENTAL ASSESSMENT

US Army Corps
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Information about Draft Finding Of No Significant Impact
The proposed action is not expected to significantly affect the quality of the human environment. If this judgment is confirmed through coordination of this ERR and EA, then an Environmental Impact Statement will not be required, and the draft Finding of No Significant Impact (FONSI) will be converted into a final FONSI and signed by the District Engineer.

DRAFT FINDING OF NO SIGNIFICANT IMPACT

I have reviewed the Environmental Assessment (EA) for the proposed action.
This finding incorporates by reference all discussions and conclusions contained in the EA enclosed herein. Based on information analyzed in the EA, reflecting pertinent information obtained from cooperating Federal and State agencies having jurisdiction by law and/or special expertise, and from the interested public, I conclude that the considered action would have no significant impact on the quality of the human environment and does not require an environmental impact statement. Reasons for this conclusion are, in summary:

1. The proposed action would be undertaken from three feet below the water level at the bank of the canal and along the remaining right-of-way of the C-9 flood control project. Minimal environmental resources occur on this site.

2. The Final Fish and Wildlife Coordination Act Report of December 12, 2001, located in Appendix III, indicates support for the project by the Department of the Interior and reflects that the project is in full compliance with the Endangered Species Act. Coordination under the Coastal Barrier Resources Act and the Fish and Wildlife Coordination Act has been completed. Measures to eliminate, reduce, or avoid potential adverse impacts to fish and wildlife resources would be implemented during the project construction.

3. Pending the State's concurrence with the Coastal Zone Consistency Act (CZM) Determination (Appendix IV), the action is consistent with the State's CZM programs.

4. Historic properties included in or eligible for inclusion in the National Register of Historic Places are not likely to be adversely affected in the proposed project area.

5. Standard Manatee Protection Measures, Eastern Indigo Snake Protection Measures and a site reconnaissance to ensure no nesting wood storks are in the project area would be implemented.

_____ _____

Date

James G. May
Colonel, Corps of Engineers
Commanding

SYLLABUS

The C-9, or Snake Creek Canal, was originally one of many "transverse glades" that provided conveyance for natural freshwater inflows into Biscayne Bay through the Atlantic Coastal Ridge. The Snake Creek Canal was originally constructed as an element of the plan to drain the Everglades for agricultural and urban use by the Everglades Drainage District. Following the catastrophic floods of 1947, it was included in the US Army Corps of Engineers' Central & Southern Florida Flood Control Project for improvement for the purpose of flood damage reduction.

This report recommends project modification of C-9 for the improvement of the environment under the Authority of Section 1135 of the Water Resources Development Act of 1986, as amended. The proposed plan of modification involves creation of submerged littoral ledges, or shelves 10 to 15 feet wide for 300-foot lengths along the C-9, Snake Creek Canal. The littoral shelves will have 100-foot gaps between them for canal maintenance. The littoral shelves will create habitat for fish, invertebrates, and wading birds. It is also expected that water quality improvements obtained from the proposed aquatic and riparian plantings will benefit the canal; the receiving bodies, the Oleta River and Biscayne Bay; and the surficial aquifer below. Riparian zones of native plant cover will be created along the canal and will extend from the littoral shelves into the upland. The riparian zone will provide important habitat for numerous species of reptiles, amphibians, small mammals and birds. A unique feature of the proposed action is that the riparian zone vegetation would also fuel the biological productivity of the already highly significant ecosystem that would occur along the littoral shelves. The combination of these two habitat types would produce more ecological value than if they were separate, stand alone, features. The proposed action also includes numerous, though relatively small, upland hammocks. Although small, these upland hammocks would be multi-canopied, providing considerable, diverse, habitat to numerous species.

The plan also includes an outdoor recreation component consisting of nature trails, a small pedestrian bridge, interpretative signs, and benches. The total project cost is estimated at $2,489,000 and would be cost shared 75% Federal and 25% non-Federal for the ecosystem project and 50% each for the recreational component, except for the recreational betterment which would be funded at 100% non-Federal cost. The total cost shared amounts are currently projected to be **$1,618,155 Federal** and **$870,945 non-Federal**. The estimated cost of the recreational component is $527,700. The Federal cost share would be $147,105 and remaining $380,595 would be provided by the non-Federal sponsor, as it is a Corps requirement to not increase the Federal costs of the project by more than 10%. The project has support from resource agencies, environmental groups, the local community, and the general public.

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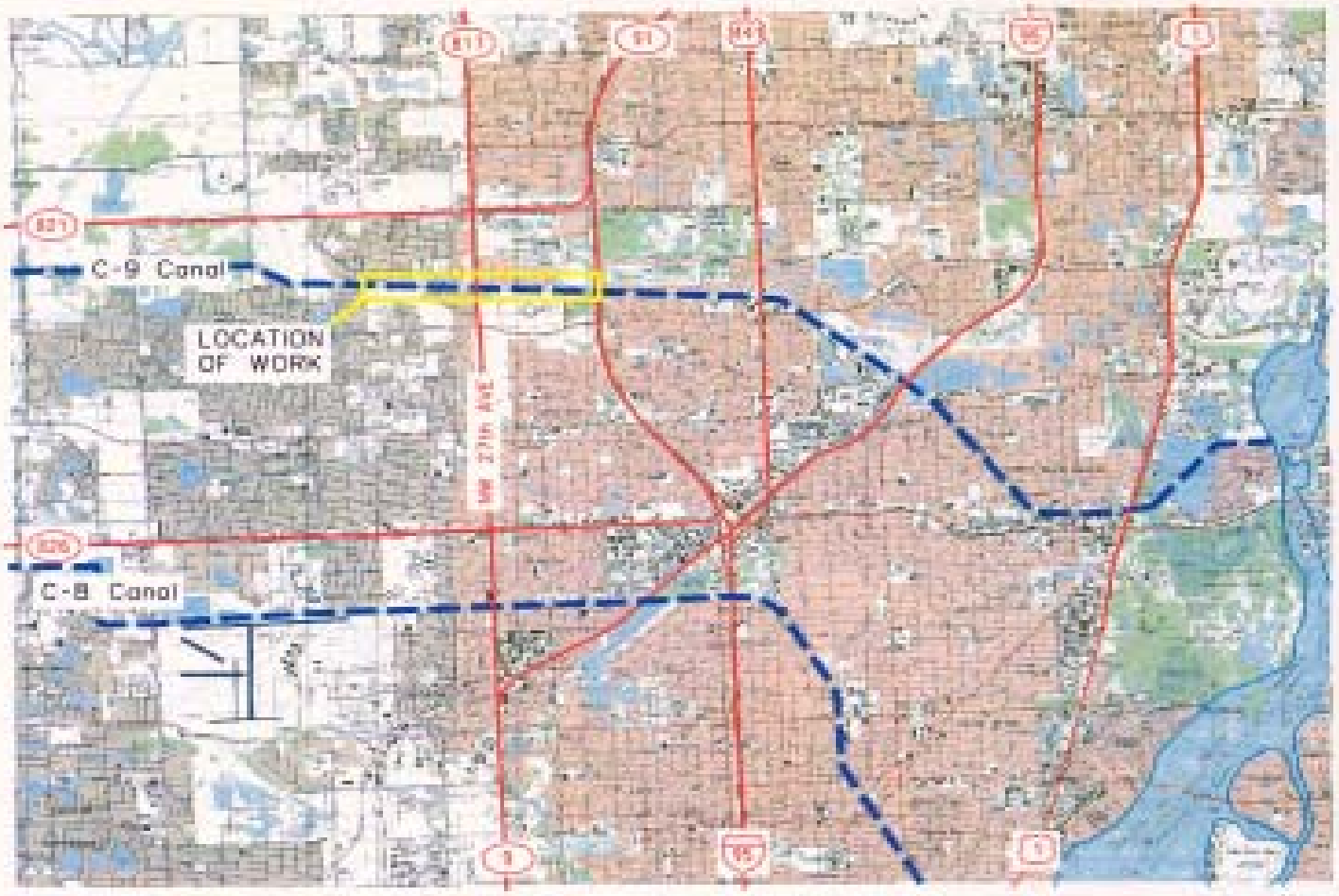
1 INTRODUCTION

1.1 Background

Snake Creek Canal, also known as C-9, is a flood conveyance canal in an extensively urbanized area of Dade County, Florida. The location is shown in Figure 1. Initial urbanization began here on high ground known as the Atlantic Coastal Ridge because of the natural flood protection it provided. Eventually urban and agricultural development spread into the more flood prone areas necessitating improved flood protection. Historically, shallow sloughs, known as transverse glades, breached the Atlantic Coastal Ridge, draining excess runoff from the upper Everglades region to Biscayne Bay. Since it was more effective to remove material from a waterway, than cut through hard limestone, much of the initial ditching associated with canal construction, occurred in these transverse glades. One of these transverse glades was Snake Creek slough. Currently, with the exception of the canal, there is virtually no natural habitat, or greenway, remaining in the Snake Creek Canal watershed. The local community, along with various environmental interests, believe that restoring at least some of the Snake Creek ecosystem would have a significant positive impact on their area. This report evaluates the options and feasibility of an ecosystem restoration project along portions of Snake Creek Canal and recommends a plan of action.

1.2 Authority

The Snake Creek Canal was constructed under the authority of the Flood Control Acts of June 30, 1948 and September 3, 1954, as part of the Central & Southern Florida Project for Flood Control for the purpose of draining a basin of approximately 30 square miles.



LOCATION MAP

VICINITY MAP

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1135 of the Water Resources Development Act of 1986 (PL 99-662), as amended; a Continuing Authority. Section 1135 provides authority to review and modify the structures and operations of Corps of Engineers' water resources projects for the purpose of improving the quality of the environment when it is determined that such modifications are feasible, consistent with the authorized project purposes, and will improve the quality of the environment in the public interest. If it is determined that a Corps water resources project has contributed to the degradation of the quality of the
environment, restoration measures may be implemented at the project site or at other locations that have been affected by the construction or operation of the project, if such measures do not conflict with the authorized project purposes.

1.3 Purpose and Scope

The purpose of this study of to present a recommended plan of project modification for the improvement of the environment for the C-9, Snake Creek Canal, basin. This ERR follows the guidelines of Engineer Regulation (ER) 1105-2-100, the Planning Guidance Notebook, dated 22 Apr 2000; ER 1165-2-501, Civil Works Ecosystem Restoration Policy, dated 30 Sep 1999; Engineer Pamphlet (EP) 1165-2-502, Ecosystem Restoration - Supporting Policy Information, dated 30 Sep 1999; Engineer Circular (EC) The purpose of this study is to present a recommended plan of project modification for the improvement 1105-2-214, Planning Project Modifications for the Improvement of the Environment and Aquatic Ecosystem Restoration, dated 30 Nov 1997; and Policy Guidance Letter 59, Recreation Development at Ecosystem Restoration Projects, dated 11 Jun 1998.

The alternative plans of improvement for the Snake Creek Canal concentrated largely on creation of areas along the existing canal right of way where habitat could be enhanced. The rationale being that it was important to keep total project costs at a minimum. Because of the heavy urbanization of the basin, real estate costs are at a premium.

1.4 Corps Ecosystem Restoration Philosophy

An ecosystem is a biotic community together with its physical environment, considered as an integrated unit. Ecosystem Restoration is now one of the primary missions of the Corps Civil Works programs. Civil Works ecosystem restoration initiatives attempt to accomplish a return of natural areas or ecosystems to a close approximation of their conditions prior to disturbance, or to a less degraded, more natural condition. Where a return to pre-disturbance conditions may not be feasible, partial restoration may be possible, with significant and valuable improvements made to degraded ecological resources. The needs for improving or re-establishing both the structural components and the functions of the natural area are examined. The goal is to partially or fully reestablish the attributes of a naturalistic, functioning, and self-regulating system.

The purpose of Civil Works ecosystem restoration activities is to restore significant ecosystem function, structure, and dynamic processes that have been degraded. The concepts of ecosystem function and structure are closely intertwined, and both include abiotic and biotic elements and processes. Ecosystem structure is the state and spatial distribution of material forms within the ecosystem at a specified time. It includes both microscopic and macroscopic material components in diverse living and non-living assemblages. Ecosystem functions are dynamic processes that can be characterized by rate and direction of change in material and energy flows through time and space.

Ecosystems are hierarchical and can be viewed as nested sets of open systems in which physical, chemical, and biological processes form interactive subsystems. Ecosystem restoration can be directed at different sized ecosystems within the nested set, and may encompass multiple states, more localized watersheds, or a smaller complex of aquatic habitat. This discussion is important in that the Snake Creek

Canal can be thought of a nested set of the larger Kissimmee - Lake Okeechobee - Everglades system as described in detail below.

1.5 Study Area

Snake Creek, C-9, flows through the City of North Miami and Carol City. While the majority of the basin is located in Dade County, the northern portion is located in Broward County. The canal extends from the Oleta River generally westerly for approximately 20 miles through a heavily populated urban/residential area. The location of the canal is shown in Figure 1 and the project area is shown in Figure 2.

1.6 Prior Studies, Reports and Existing Water Resource Projects

Snake Creek Canal is a component of the Central and Southern Florida (C & SF) project authorized initially in the early 1900's with numerous subsequent supplemental authorizations. Many of the Corps former C&SF projects are being reviewed for possible ecosystem restoration. The largest of these is the C&SF Comprehensive Review Study (Restudy) which is now being implemented as the Comprehensive Everglades Restoration Project (CERP). There are numerous reports dealing with the Restudy and CERP and information about these can be found on the Internet at Jacksonville District's and South Florida Water Management District (SFWMD) homepages. Smaller projects that are complementary to the multi-billion dollar, 30 year CERP effort, are also being evaluated for restoration similar to this, the C-9 Ecosystem Restoration Report (ERR). Specifically, ERRs are being concurrently prepared for C-7 and C-8 ecosystem restoration projects.

1.7 Partners

This study was conducted through a partnership between the non-Federal sponsor, the South Florida Water Management District (SFWMD) and the Jacksonville District of the U.S. Army Corps of Engineers (Corps). Other stakeholders include the Miami-Dade County Department of Environmental Resources Management (DERM), the City Of Miami, the City of North Miami, the City of Opa Locka, and various natural resource agencies. There has also been strong Congressional support for this effort.

1.8 Integrated NEPA and ERR Document

Council on Environmental Quality Guidelines encourage the integration of NEPA reports with other documents, such as planning reports, in order to reduce paper work and to present information in a concise manner. The Corps strongly supports this approach. It is particularly applicable to prepare a single, integrated, NEPA and ERR document, because the primary impacts of the proposed action are the very benefits that the ecosystem restoration project is trying to achieve.

2 ENVIRONMENTAL SETTING

2.1 Regional Historic Conditions

The following is a brief history of South Florida since it is important to understand the pre- drained environment, the Corps project to be modified, and the reason for its construction from a regional perspective.

The interior of the southern half of Florida is dominated by the Everglades, "a vast, shallow sawgrass marsh, dotted with tree islands and interspersed with wet prairies and aquatic sloughs." The low, trough-shaped Everglades marshland is bordered on the east and west by higher lands - the Atlantic Coastal

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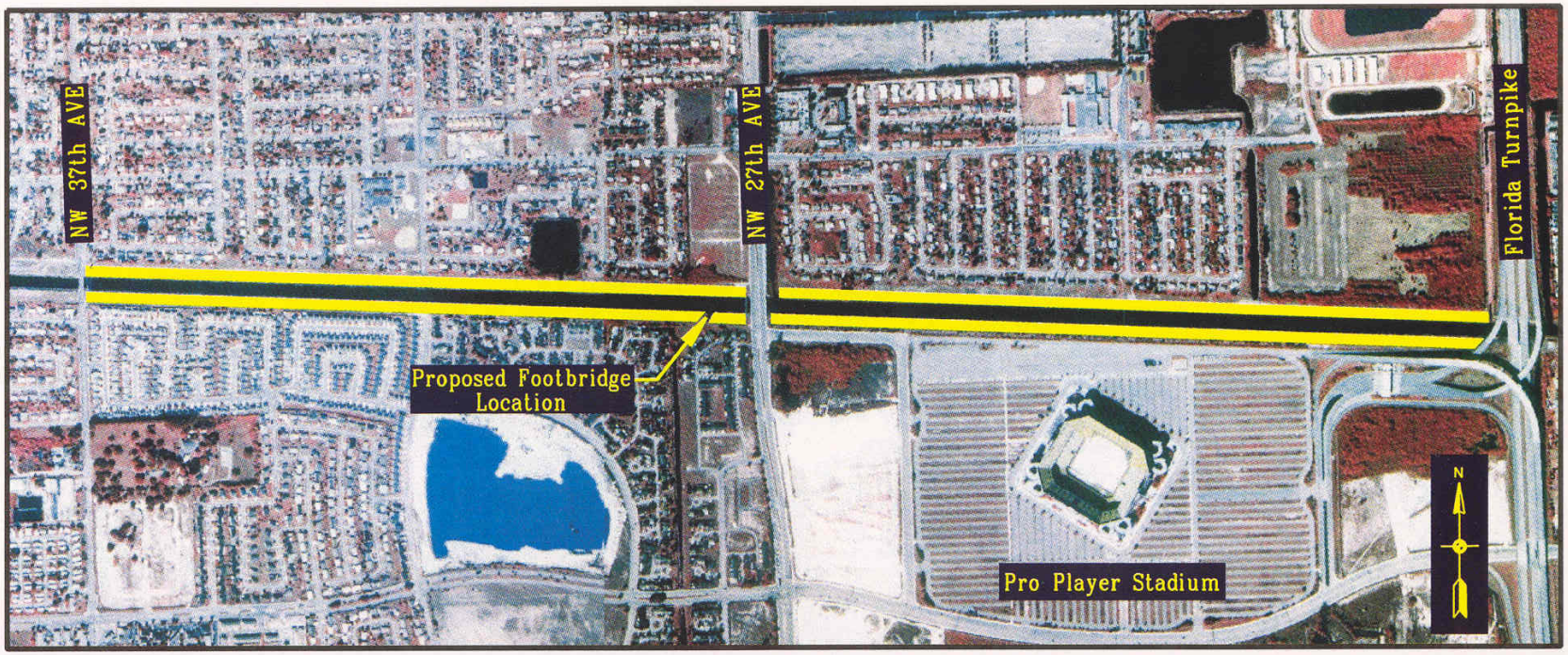


PROJECT STUDY AREA

Ridge on the east and the Immokalee rise on the west. The predevelopment Everglades was 40 mile wide and 100 miles long.

The historic Everglades originates at the headwaters of the Kissimmee River. The Kissimmee naturally drained into shallow Lake Okeechobee, which originally had no well-defined outlet. During the wet season, the lake regularly overflowed its banks and sent a sheet of freshwater south over the Everglades, west into the Caloosahatchee River and east into the Allapattah, Hungryland, and Loxahatchee Sloughs. Surface waters also drained to the east through the St. Lucie, New, and Miami Rivers. Some percentage also recharged the Biscayne Aquifer, or simply evaporated. Further south, the accumulated surface water found an outlet to the coastal estuaries, the receiving areas where freshwater mixes with salt, through low marshy breaches in the Atlantic Coastal Ridge. These shallow freshwater marshes, or "transverse glades" constituted an important source of freshwater inflows to south Biscayne Bay.

Estuaries are highly productive, serving as nursery grounds for many aquatic organisms. Biscayne Bay is one of the most important estuaries in the South Florida ecosystem. The bay is approximately 40 miles long and historically, the average depth was three to nine feet. The bay's bottom was dominated by sea grasses, and the shores were lined with mangrove. The Atlantic Coastal Ridge forms a natural barrier between the Bay and the Everglades. The Ridge acted as a drainage barrier, except at its lowest areas, where freshwater could flow to the Bay from the west, through the transverse glades. One of which was Snake Creek.

When Florida became a state in 1845, there were only 55,000 residents, most of whom lived north of Gainesville. Agriculture had come to form the basis for this young economy. However, agricultural production in much of the state, particularly in the south, was limited by wetlands.

Draining these lands to make them more suitable for agriculture became a much sought after goal, and would do much to shape Florida's future and reshape its natural environment. In an effort to stimulate settlement, the federal government, under the Swamp and Overflowed Lands Act, declared two-thirds of the state swamp, overflowed, and "unfit for civilization". Under this Act, the federal government gave the state 24 million acres. The Act specifically required that proceeds from the sale of these lands be used for reclamation.

Reclamation of land for agricultural and residential uses became an increasingly desired goal following the flood of 1903. In the governor's race of 1904, Napoleon Bonaparte Broward was elected on a platform that advocated full-scale drainage of the Everglades to make it suitable for farming. Soon after his election, Broward created the Board of Drainage Commissioners, which had the critical authority to tax property owners. In 1907 he created the Everglades Drainage District (EDD). By 1928 the Drainage District had constructed more than 440 miles of canals, to include the St. Lucie, Hillsboro, North New River, Miami, and the Caloosahatchee. These systems of canals lowered Lake Okeechobee from 22 feet to 15, and lowered the water table in southeast Florida by 5 to 6 feet. The depression brought financial ruin to the EDD, but droughts of the 1930s and floods of 1947 and 1948 led to a more comprehensive management scheme for the Central and Southern Florida region. The Corps recommended and Congress approved the Central & Southern Florida Flood Control Project (C&SF), which would impact some 15,000 square miles of central and southern Florida. Water management project purposes included flood control, water supply (residential, industrial, and agricultural), reduction of over drainage and salt water intrusion, preservation of fish and wildlife resources, recreation, and navigation. The plan included the creation of the Everglades Agricultural Area (EAA) and Water Conservation Areas (WCAs) encompassing some 1.3 million acres; channelization of the Kissimmee River; a levee encircling Lake Okeechobee with control structures and pump stations; and local protective works along the developed lower east coast. The construction of the C&SF project required a non-Federal sponsor to share in project costs, and operation and maintenance of the various water control structures and operation schemes. In

1949 the Florida legislature created the Central and Southern Florida Flood Control District, later to become the South Florida Water Management District (SFWMD). The bulk of the construction for the C&SF project took place in the 1950s and 1960s, with an eventual cost of nearly $1 billion.

2.2 Historic Conditions of Snake Creek Watershed

Snake Creek slough, with its shallow, slow moving water, provided very important fish and wildlife habitat as it drained water to the coast. It had been reported that during the dry season these streams, or transverse glades, disappeared through fissures in the limestone but could still be heard underground below the pine forest that covered the Atlantic Coastal Ridge. As was typical of flood control projects during that era, Snake Creek was made into a straight channel, by ditching through both the original waterway and predominantly limestone, upland areas. While the Snake Creek watershed may have encompassed part of the Everglades, it was predominantly pine forest with an understory of shrubby hardwoods, palms and herbs. This forest consisted mainly of South Florida slash pine, but it was interspersed with hammocks that contained various assemblages of tree, shrub and palm species, depending on the degree of wetness that occurred there. The largest number of endemic species in the continental US were found in the pinelands of Dade County. Of 186 native species recorded during a pineland inventory, 67 were considered exclusive to South Florida pinelands. Most of the plant species listed in Appendix I were likely to have occurred in the project area. By 1984 Dade County had lost 98% of its pineland and hardwood hammocks. Other water projects throughout Central and Southern Florida also profoundly affected the ecosystem of the Snake Creek watershed. One of the most significant of the environmental impacts was the lowering of the water table by 5 to 6 feet from the extensive drainage performed by the Everglades Drainage District.

2.3 Existing Conditions

2.3.1 General

The existing condition of the Snake Creek watershed can be best described as extensively and intensively urbanized. There is very little undeveloped land remaining in the watershed and, except for some artificial ponds there is no other significant wetland or aquatic habitat remaining in the watershed.

2.3.2 Soils and Geology

Soils in the project area are typically classified as udorthents-limestone substratum-urban land and consist of primarily stony sandy-loam with hard porous limestone bedrock (USDA 1996).

2.3.3 Climate

South Florida's climate is subtropical, with wet, humid summers and relatively dry moderate winters. The subtropical climate is greatly attributable to the moderating influences of the Gulf Stream. The state's rainfall averages some 53 inches per year. The temporal distribution of this rainfall is seasonal, with 75 percent falling during the summer wet season (May through October).

2.3.4 Hydrology

The hydrology of **Snake Creek Canal (C-9)** is determined primarily by runoff from the highly urbanized watershed and operation of **Structure 29 (S-29).** Due to the lowered water table through the area, there is concern about saltwater intrusion. Therefore the Snake Creek Canal is operated for both flood protection and prevention of saltwater intrusion through maintaining an optimum level in the canal. S-29 is a reinforced concrete, gated spillway, with discharge controlled by four cable operated, vertical lift gates.

Operation of the gates is automatically controlled so that the gates open or close in accordance with the seasonal operational criteria. The structure is located in the City of North Miami Beach near the mouth of Snake Creek Canal about 500 feet downstream (east) of U.S. Highway 1 and about 500 feet from the shore of Lake Maule. The S-29 passes the design flood (100 percent of the Standard Project Flood) without exceeding upstream flood design stage, and restricts downstream flood stages and discharge velocities to non-damaging levels; and it prevents saline intrusion during periods of high flood tides. This structure maintains an optimum headwater elevation of 2.0 feet when sufficient water is available to maintain this level. Moreover, it is used to control high water conditions at the western end of the C-9 canal insofar as practical.

The automatic control functions are as follows:
When the headwater elevation rises to 2.5 feet, the gates will open at six inches per minute. When the headwater elevation rises or falls to 2.0 feet, the gates will become stationary. When the headwater elevation falls to 1.5 feet, the gates will close at six inches per minute.

The automatic controls on this structure have an overriding control, which closes the gates, regardless of the upstream water level in the rare event of a high flood tide, whenever the differential between the head and tailwater pool elevations reaches 0.3 feet.

In order to control flooding at the west end of the C-9 canal, there is a variation to the operation, which involves concurrent operation of Structure 30 located at the headwater of the canal.

A special timing device has been installed at this site to protect manatees, during automatic gate operation. This device causes alternate gate operation. During this operation, when the upstream float sensor indicates that the gate should open, two gates open a minimum of 2.5 feet. If opening results in a headwater stage below the gate close level, as it often does, these gates will close. Whenever the headwater stage again rises to the gate open level, the other two gates will open in a similar manner.

2.3.5 Water Quality
Water quality is typical of an urban setting and is characterized by low dissolved oxygen and high in nitrates, phosphates and petroleum based hydrocarbons.

2.3.6 Wetlands
The only significant wetlands in the watershed are those that have established as a fringe adjacent to the banks of the canal.

2.3.7 Riparian Vegetation
There is currently no riparian vegetation in the project area. Furthermore, because of the abrupt five foot drop from the upland to the water level, meaningful riparian vegetation is not likely to become established, without some excavation along the banks of the canal to promote its development.

2.3.8 Terrestrial Habitat
The predominant vegetation in the project area right of way consists of various grasses typically found in urbanized settings including these areas is St. Augustine grass (*Stenotaphrum secundatum*), bahia grass (*Paspalum notatum)*, air potato vine (*Dioscorea bulbifera*), and other weedy species. Vegetation adjacent to the project area consists of various landscape plants on residential and commercial properties.

2.3.9 Fish

Species consist of those normally found in South Florida canals including killifish (*Cyprinodontidae*), live-bearers (*Poeciliidae*), sunfish (*Centrarchidae*), and catfish (*Ictaluridae*) families. Exotic species are also prevalent in these canals. There is very little suitable habitat to sustain a significant population of game fish or forage fish for wading birds.

2.3.10 Reptiles and Amphibians

The project area includes habitat for striped mud turtle (*Kinosternon bauri*), eastern mud turtle (*K. subrubrum*), eastern mud snake (*Farancia abacura*), and cottonmouth (*Agkistrodon piscivorus*). Amphibians expected to occur within the canals and surrounding habitat include oak toad (*Bufo quercicus*), southern cricket frog (*Acris gryllus dorsalis*), tree frogs (*Hyla* spp.), little grass frog (*Pseudacris ocularis*), and narrowmouth toad (*Gastrophryne carolinensis*).

2.3.11 Invertebrates

There is little information about invertebrates in the canal. Blue crab and crawfish are known to occur there. Invertebrates are a very important foundation of an ecosystems food web.

2.3.12 Mammals

The residential areas provide habitat for mammals that can adapt to human environments. The canal banks provide foraging opportunities for some mammals since the canals support prey species (*e.g*., blue crab). Mammals likely to be found in the study area include the domestic dog (*Canis domesticus*), opossum (*Didelphis marsupialis*), house mouse (*Mus musculus*), cotton mouse (*Peromyscus gossypinus*), raccoon (*Procyon lotor*), black rat (*Rattus rattus*), hispid cotton rat (*Sigmodon hispidus*), nine-banded armadillo (*Dasypus novemcinctus*), and eastern mole (*Scalopus aquaticus*). During some operating conditions of the water control structures, such as during very high flows, manatee have been known to enter the canals.

2.3.13 Birds

Avifaunal occurrences in the project area result primarily from occasional/seasonal use of canals by water birds (*i.e.*, waterfowl, wading birds). The canals also provide foraging habitat during low water periods for common water birds such as double-crested cormorant (*Phalacrocorax auritus*), anhinga (*Anhinga anhinga*), great blue heron (*Ardea herodias*), cattle egret (*Bubulcus ibis*), green heron (*Butorides striatus*), little blue heron (*Egretta caerulea*), black-crowned night heron (*Nycticorax nycticorax*), snowy egret (*E. thula*), great egret (*E. alba*), white ibis (*Plegadis chihi*), and glossy ibis (*P. falcinellus*). Because of the lack of shallow water, productive habitat, the canal provides a very limited amount of food for wading birds. The vegetative structure present along the canal banks provides limited shelter and nesting habitat for common passerine birds such as northern cardinal (*Cardinalis cardinalis*), mockingbird (*Mimus polyglottos*), house sparrow (*Passer domesticus*), rufous-sided towhee (*Pipilo erythrophthalmus*), American robin (*Turdus migratorius*), red-winged blackbird (*Agelaius phoeniceus*), eastern meadowlark (*Sturnella magna*), common grackle (*Quiscalus quiscula*), boat-tailed grackle (*Q. major*), and brown-headed cowbird (*Molothrus ater*).

2.3.14 Threatened and Endangered Species.

While there is virtually no suitable habitat for the listed species of birds contained in Table 1, they do occasionally occur in the area. According to the Fish and Wildlife Service, Appendix V, the wood stork is the only federally listed avian species likely to occasionally utilize the canal for foraging. The largest population of the Eastern indigo snake occurred in Dade County. Even though protected as a threatened species, collection of this snake constitutes one of the most profitable illegal animal trades in Florida. More recently, manatee protection features have been

added to the S-29 to protect this endangered species from the operation of this structure but it will not always prevent their entry under certain operating conditions.

There are no known listed plant species that are likely to occur in the project area. The US Fish and Wildlife Service stated the following in their Coordination Act Report (Appendix V): "The nature of the habitats along the canals makes it highly unlikely any of the federally listed plant species would be present. None of the listed plant species were apparent during the site visits."

Table 1 Federal Threatened and Endangered Species and State Species of Special Concern

Federally Listed Species

Name	Status
Snail Kite (*Rostrhamus sociabilis*)	Endangered (E)
Wood Stork (*Mycteria americana*)	Endangered (E)
West Indian Manatee (Trichechus manatus)	Endangered (E)
Eastern Indigo Snake (*Drymarchon corais couper*)	Threatened (T)

Florida Game and Freshwater Fish Commission Listed Species

Name	Status
American Alligator (*Alligator mississippiensis*)	Special Concern
Miami Black-headed Snake (Tantilla oolitica)	SC
Limpkin (*Aramus guarauna*)	SC
Little Blue Heron (*Egretta caerulea*)	SC
Tri-colored Heron (*Egretta tricolor*)	SC
Snowy Egret (*Egretta thula*)	SC
White Ibis (*Eudocimus alba*)	SC
Roseate Spoonbill (Ajaia ajaja)	SC
Osprey (Pandion haliaetus)	SC

2.3.15 Cultural Resources

There are no known cultural resources in the Snake Creek Canal project area. Consultation with the Florida State Historic Preservation Officer (SAI#FL9602292118C) has indicated that because of its location the project area is not likely to contain cultural resources eligible for listing in the National Register of Historic Places.

2.3.16 Socio-economics

The area surrounding the proposed project site is heavily developed, and within the jurisdiction of Miami-Dade County government agencies (School Board, Parks Department). Hialeah is one of Miami-Dade County's largest incorporated areas. The area is truly a cosmopolitan county due to the mix of cultures. Major private employers are airlines, department stores, communications, banking, transportation and food service. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1989 to 1999 was retail trade (9.6 percent of earnings in 1999), which increased at an average annual rate of 3.7 percent; the fastest was finance, insurance, and real estate which increased at an average annual rate of 6.8 percent (Bearfacts, 1989-1999, Miami-Dade County).

In 1999, Miami-Dade had a per capita personal income (PCPI) of $24,733. This PCPI ranked 21st in the State, and was 89 percent of the State average, $27,781, and 87 percent of the national

average, $28,546. Miami-Dade is one of 67 counties in Florida. It is part of the Miami Metropolitan Area. Its 1999 population of 2,175,634 ranked 1st in the State. Miami contained over 121,000 Hispanic-owned firms that employed over 128,000 people and generated over $27 billion (Bureau of the Census, 2001). Miami-Dade County is one of the largest school districts in Florida with 15.78% of the state's student population that is comprised of over 80% minorities. Within the population of 25 year olds and older, over 51.95% do not hold a high school degree. In Miami-Dade County (in 1990), registered 22.98% of the households supported by public assistance income in the state of Florida (1990 US Census).

2.3.17 Recreation

There are no recreation facilities in the project area though it is used informally for outdoor activities such as walking, jogging bird watching and, very limited, fishing. Plans to develop regional greenways through Dade County are in place, and these include the Snake Creek Canal right of way. Existing parks which could be connected with the regional greenways include Oleta River State Park about 10.5 miles to the east of North Miami Beach and Amelia Earhart Park about 7.5 miles to the southwest. A nearby school could readily be connected to the Snake Creek nature trail.

2.3.18 Aesthetics

Snake Creek Canal is straight, with virtually no trees along it banks or right of way. The only significant vegetation growing nearby is in residential back yards and landscaping in commercial areas. Most of the project lands adjacent to the canal are maintained in lawn grasses. Though the canal, with its straight waterway and featureless right of way, provides a mundane visual effect, it is still a pleasant contrast from the highly urban setting in which it is located.

2.4 Future Without Project Conditions

Without an ecosystem restoration project, C-9 would continue to be operated for its authorized project purposes of flood damage reduction and S-29 for its authorized project purpose of controlling saltwater intrusion.

The Corps has been under considerable, and sustained, pressure to evaluate ecosystem restoration projects along the canal and right of way. This sustained pressure would likely intensify if it was perceived that the Corps had an unacceptable reason for not performing an ecosystem restoration along Snake Creek Canal. At a minimum, some ecosystem restoration project, with a recreational component, would probably be built in this area even if the Corps, for some reason, decided against it at this time. It is also conceivable that State, local government and various environmental and recreational stakeholders would develop a project for this area that goes beyond that recommended in this ERR.

3 PLAN FORMULATION

3.1 Process

3.1.1 Six step planning process

The Corps uses a six step planning process which provides a structured approach for problem solving through a rational framework that leads to sound decision making. The six steps are: Identifying Problems and Opportunities; Inventorying and Forecasting Conditions; Formulating Alternative Plans; Evaluating Alternative Plans; Comparing Alternative Plans; and Selecting a Recommended Plan. Forecasting Conditions was partially covered in Section 2 under Environmental Setting and the remainder is covered under scoping, which is the process of getting public and stakeholder input. The other four steps deal with some phase of developing

and selecting alternatives and that is the primary purpose of this document. Development of alternatives and selection of the preferred alternatives is covered in sections three (3) through six (6).

3.1.2 Identifying Problems And Opportunities

Proper identification of problems and opportunities is the foundation for scoping in the planning process. The C-9, Snake Creek Canal, basin has undergone marked degradation due to channelization, with steep side slopes and water depths unsuitable for desired habitat. Symptoms include loss of nursery areas for fish, invertebrates, and wading birds. Loss of native aquatic vegetation is a problem as well. Water quality is also of concern, for not only the canal and receiving bodies, the Oleta River and eventually Biscayne Bay, but also quality concerns to the surficial aquifer below. Salt-water intrusion also a concern, and minimum canal stages are required to avoid well contamination. Nuisance flooding is also a problem basin-wide. Finally, the area has few facilities for outdoor recreation.

3.1.3 Objectives & Constraints

From the preceding discussion of problems and opportunities, project objectives and constraints were identified.

- create habitat for fish, invertebrates, and wading birds
- restore native aquatic vegetation
- remove exotic vegetation where applicable
- restore upland vegetation to provide buffer
- improve water quality in the canal; its receiving bodies, Oleta River and Biscayne Bay; and the surficial Biscayne Aquifer below
- avoid salt water intrusion and well contamination
- lessen the impact of nuisance flooding
- realize opportunities for an integrated restoration project and recreational facility, to include trails and interpretive signs

3.1.4 Inventorying And Forecasting Conditions

The second step of the planning process is to develop an inventory and forecasts of critical resources (physical, demographic, economic, etc.…) relevant to the problems and opportunities under consideration in the planning area.

The canal and adjacent project lands provide a unique opportunity for restoring, at least in part, some of the former Snake Creek slough ecosystem. Because of the very high residential density around this potential ecosystem restoration project, it would be highly desirable to incorporate nature related recreational features into the overall plan. The limitations are the relatively narrow land area that could be utilized, need for leaving considerable shoreline intact for maintenance purposes and the Federal cost limit to the ecosystem restoration project. Also, all alternatives, and increments of the alternatives must be cost effective with the benefits worth the costs.

3.1.5 Public Involvement

An interdisciplinary team was established to investigate a broad range of ecosystem restoration scenarios. One of the major responsibilities of this team was to solicit and review public comments. This input from the public was from scoping meetings and workshops. They also had discussions with, and received comments from, Federal, State and local agencies and environmental groups. In general all comments and ideas were considered. As conceptual alternatives were developed, public workshops continued to be held in the project area. Project alternatives were explained at these workshops and the public's views were solicited.

3.1.6 Formulation of Alternatives

Alternative plans are formulated to meet the previously identified planning objectives while avoiding planning constraints. No alternative may diminish the authorized project purposes of flood control and prevention of saltwater intrusion, without specific authorization to make such a change. Alternatives are built from one or more management measures. A measure is a feature or activity that can be implemented at a specific geographic site to address one or more of the planning objectives; they can be either structural or non-structural. Features are usually structural measures and typically require construction or assembly. Activities are usually nonstructural measures and often are actions, procedures, or policies that affect actions or procedures.

Ecosystem restoration concepts for C-9 took on the form of littoral shelves within the canal, wetland and pond complexes within the project right of way, islands in the canal and various combinations of such schemes. At first it appeared that pond and wetland complexes with an island in the center would provide all the requirements of many wading birds. Foraging, loafing and nesting habitat in one place. As this concept was investigated further it was discovered that due to the project right of way limits the ponds would need to be very long and narrow. Also the water depth would be at 5 feet for most of the time, which would further reduce the functional wetlands area of such a complex. Need for an access road within the ROW to bring in maintenance equipment further reduced the area that could be allocated for ecosystem restoration. It was also concluded that constructing islands in the canal would hinder flood water conveyance and reduce canal capacity. After considerable deliberations, the interdisciplinary team focused their attention on the littoral ledge concept since it appeared to be viable and provide the best environmental outputs for the expenditure of Federal and State funds.

3.2 Formulating Initial Alternatives

3.2.1 Measures Considered:

Excavation of littoral shelves(or ledges) to create shallow zones.
- Width of littoral shelf – 6, 8, 10, 5, 20, 30 feet
- Length of littoral shelf
- Depth of littoral shelf
- Location of shelf – one or both sides of canal
- Continuous shelf, or with gaps for maintenance?

Create pond, outside of existing channel, but connected to the canal
Create pond with an island, outside of existing channel, but connected to the canal
Passively re-vegetate from seed bank
Plant vegetation
- Density of new plants on the shelf
- Species to plant
- Allow vegetation to occur naturally

Install diffusers at point source discharges– force water to flow through vegetation to get to canal
Create ponds in ROW between discharge points and the canal
Place fill in sections of the canal to provide shallow areas
Create islands in canal, with gradual banks
Disposal of Excavated material
Nature trail an appurtenant facilities

It often helps to display measures and objectives in a matrix, as shown in Table 2, to get a feel for which measures meet the most objectives. These are the most desirable for combination to form alternative plans.

Table 2: Objective / Measure Matrix

Do the measures contribute to objectives?							
		Objectives					
Measures		Bird habitat	Fish nursery	Diverse shore	Native vegetation	Recreation	Water Quality
	shelf	X	X	X			X
2	pond	X	X				
3	pond/ island	X	X				
4	passive	?	?	X	?		
5	plant	X	?	X	X		X
6	diffusers				X		
7	settling	X					
8	fill	X		X			
9	islands	X		X			
10	trail					X	

3.2.2 Preliminary Alternatives

The following alternatives were developed from the initial measures that had been presented by the study team and are based on input from numerous stakeholders.

Alternative 1

Excavate **ponds** adjacent to canal; connect ponds to main canal with culvert or open canal; dimensions of pond to be determined (TBD) based on available right-of-way (ROW). A path would be constructed parallel to the canal; signs describing the ecosystem restoration will be installed; other recreational features may also be included.

Alternative 2

Excavate **ponds** adjacent to canal; construct **islands** in the ponds; connect ponds to main canal with culvert or open canal; dimensions of pond to be determined (TBD) based on available right-of-way (ROW). A path would be constructed parallel to the canal; signs describing the ecosystem restoration will be installed; other recreational features may also be included.

Alternative 3

Excavate littoral shelf parallel to canal; shelf to be nearly **continuous** along entire length of project area; **graduated** depth (shallow near upland, deeper near canal); width of shelf TBD. A path would be constructed parallel to the canal; signs describing the ecosystem restoration will be installed; other recreational features may also be included.

Alternative 4

Excavate littoral shelf parallel to canal; shelf to be nearly **continuous** along entire length of project area; **stepwise** depth (alternating 1 foot, 2 foot, and 3 foot deep sections); width of shelf TBD. A path would be constructed parallel to the canal; signs describing the ecosystem restoration will be installed; other recreational features may also be included.

Alternative 5

Excavate littoral shelf parallel to canal; shelf to be short wetland sections that **alternate** with sections of relatively unmodified uplands along the entire length of project area; **graduated** depth (shallow near upland, deeper near canal); width of shelf TBD. A path would be constructed

parallel to the canal; signs describing the ecosystem restoration will be installed; other recreational features may also be included.

Alternative 6

Excavate littoral shelf parallel to canal; shelf to be short wetland sections that **alternate** with sections of relatively unmodified uplands along the entire length of project area; **stepwise** depth (alternating 1 foot, 2 foot, and 3 foot deep sections); width of shelf TBD. A path would be constructed parallel to the canal; signs describing the ecosystem restoration will be installed; other recreational features may also be included.

Common Feature in Alternatives. All alternatives include planting native vegetation. Allowing passive colonization would be much less expensive but the risk of invasive species would be too great. The area may be colonized by invasive exotic species or otherwise less desirable plants. Also, time required for plant material to be productive, or contribute to outputs/benefits would be less than desirable. Also all alternatives that have littoral shelves, contain a riparian planting zone, very limited plantings of upland hammocks and minimum, nature oriented, recreation features. The team felt that it was not necessary to fully develop these features until they were closer to selecting the preferred alternative.

3.3 Screening Criteria for Alternatives

The evaluation of effects is a comparison of the with-project to the without-project conditions for each alternative. The inability to quantify ecosystem benefits in the familiar metric of dollars makes the evaluation of plan effects the single biggest challenge in ecosystem planning. Corps Water Resource Development projects are evaluated in terms of acceptability; completeness; effectiveness; and efficiency. Completeness is the extent to which the alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by the Federal and non-Federal entities. Effectiveness is the extent to which the alternative plans contribute to achieve the planning objectives. Efficiency is the extent to which an alternative plan is the most cost effective means of achieving the objectives. And finally, Acceptability is the extent to which the alternative plans are acceptable in terms of applicable laws, regulations, and public policy.

Though these criteria are largely subjective, there are minimum thresholds, below which an alternative plan may be dropped from consideration, this occurs both in the initial screening phase and later once alternatives are evaluated further. One criteria that is not subjective and is strictly adhered to, is that no preliminary alternative that may have a significant negative impact on the authorized project purposes of flood control and salt water intrusion prevention, will be carried forward for further consideration.

3.4 Significance of Littoral Zone Ecosystems.

The littoral ledge that would be constructed provides a substrate for submerged aquatic and emergent vegetation to grow. A wetland vegetative type unique to Florida that should flourish in this new habitat is periphyton. There are several different types of periphyton assemblages that occur in south Florida any of which will be beneficial on the littoral ledge complex. Periphyton not only forms the basis for the food web but also significantly improves water quality by removing nutrients and raising the dissolved oxygen level. In south Florida periphyton can be a significant source of food for invertebrates and fish. Periphyton are basically an attaching algae that can grow in harmony with other beneficial wetland plants. The ledge itself will provide nesting habitat for may species of fish and the improved water quality, particularly the dissolved oxygen levels and abundant food supply, should ensure a large and varied fish population. The shallow water habitat created by the ledge will also aid feeding by wading birds. Design considerations of the ledge could further aid wading bird feeding.

3.5 Consideration of Alternatives

As noted earlier, the alternative of constructing ponds and wetlands within the ROW did not provide the benefits that the littoral ledges will provide. One reason is that the narrow right of way plus the need for access to the canal for maintenance by equipment would result in very narrow ponds and wetlands. They would also have steep slopes because the water is generally five feet from the surface and there is insufficient land for gradual slopes. Connecting these ponds and wetlands to the canal would also increase costs since culverts or bridges would be needed to get maintenance equipment to the canal's edge. After reviewing preliminary plans and cost estimates, the interdisciplinary team concluded that constructing ledges was the best way to optimize benefits while reducing costs. One benefit that the pond plans provided that has not been incorporated into the littoral alternatives is safe nesting habitat for wading birds close to their source of food. With the pond alternatives these nesting areas would be on islands surrounded by wetlands or aquatic habitat thereby providing some protection from predators and people. Constructing nesting islands in the canal was considered to be undesirable because it could diminish the primary purpose of the canal, which is flood control. Providing upland habitat in with the littoral ledge alternatives does offer the opportunity of have nesting habitat. The continuous littoral ledge alternative was also not viable because of requirements for equipment to have access to the main canal in order to maintain it for flood control and safety purposes.

3.6 Alternatives Eliminated from Further Consideration

Alternatives 1 and 2 were eliminated from further consideration because the incremental cost of constructing a long, narrow pond would require almost twice the amount of excavation as a ledge within the canal. Connecting the ponds to the canal would add additional cost since culverts or bridges would be needed to accommodate canal maintenance equipment. Even if connected the pond and lagoon concept would not be ecologically as productive as the littoral ledge alternatives. The study team determined that even a narrow pond, when combined with the appropriately gradually sloping sides up to the existing grade and a 10 foot wide crest on the upland between the canal and pond, would require too much of the available ROW. There would not be enough unused land between the ponds and the edge of the ROW for SFWMD maintenance vehicles and activities.

Alternatives 3 and 4 were eliminated from further consideration because they contain continuous littoral shelves. The shelves and side slopes would not prevent SFWMD from moving vehicles along the length of the canal, but they would prohibit SFWMD from placing cranes along the edge of the canal. SFWMD stated that they needed 100 foot segments of the canal left unmodified and that the maximum length of a ledge should be 300 feet.

Alternatives 5 and 6 were retained for additional, more detailed analysis. These alternatives have intermittent littoral shelves along the canal. The littoral shelves would provide areas for wading birds, fish and aquatic animals, and aquatic vegetation. These alternatives would provide somewhat less of these environmental benefits than Alternatives 3 and 4 because they would create somewhat less total area of littoral shelves. However, the unmodified sections between the littoral shelves would provide access to the canal by SFWMD for maintenance, which Alternatives 3 and 4 do not allow. Different combinations of dimensions of the littoral shelves and the unmodified sections were further analyzed.

4 ALTERNATIVE COMPONENTS CARRIED FORWARD FOR DETAILED ANALYSIS

4.1 No Action Alternative

NEPA and CEQ Guidelines require consideration of the No Action Alternative. Without an ecosystem restoration project, the benefits to Snake Creek Canal would be foregone. However Federal of State funds would be conserved under this alternative. The urban canal would remain in its relatively unproductive state to the detriment of the potential ecosystem, water quality improvement and social cohesiveness that the overall project would bring to the area. Since the benefits to be derived from the preferred alternative exceed the costs, the no action alternative is the least cost-effective option.

4.2 Littoral Shelf Alternatives

While the iterative plan formulation process eliminated some options because of their costs or project constraints, others became more refined and were examined in greater detail. The culmination of this process resulted in four construction alternatives. All of these construction alternatives are significant variations of the littoral zone concept. In addition to the littoral zone concept, they also have in common the sub-alternative components of: riparian and upland habitat restoration, disposal of excavated material, wetland planting approach, and some minimal, environmentally oriented, recreation facilities.

4.2.1 Gradual Slope Littoral Shelf

This design would be the easiest to construct and would extend from a foot above the normal high water line to the ordinary low water line. Bands of vegetation would be established based on their tolerance of frequency and duration of inundation. This approach would provide the considerable potential diversity of plant species, both planted and from natural sources. It may not be as beneficial to wading birds as the other littoral shelf alternatives because there would be considerably less of a concentrating effect of fish during lower water stages. It could, however, be slightly less expensive to construct because less material would need to be excavated.

4.2.2 Terraced Littoral Shelf

This design could optimize benefits to fish by providing abundant nesting habitat even under varying hydrological conditions. One concern about this approach is that, from time to time, there may be too much water over lower tiers and not enough in the emergent vegetation in the upper tier for some of the plant species to flourish. Construction costs for this alternative would be greater than for the continuous slope alternative because of more precise excavation and greater quantity of material that would need to be removed and handled.

4.2.3 Scalloped Littoral Shelf

This design would benefit primarily wading birds by concentrating prey organisms in a shallow bowl as littoral zone water was drawn. This mimics natural conditions. Availability of food can help trigger nesting behavior and be a major factor in determining the survival of fledgling birds. A scalloped littoral shelf would be more costly to excavate and plant with wetland and emergent plants. The overall benefits to fish and invertebrates would also be more variable depending on canal hydrology.

4.2.4 Undulating Littoral Shelf

This would be a compromise alternative where the littoral ledge would be excavated between one and two feet NGVD in an undulating manner but getting shallower as it gets closer to shore. This would provide considerable diversity of habitat. The disadvantage of this approach is that each plant would have to be placed at the proper water depth based on conditions following excavation. Not knowing exact quantities of each plant species until a post-excavation survey

could increase planting costs. Engineering, construction and design costs may, however, be reduced with this approach.

4.3 Riparian Zone

This potential project component consists of planting shrubs, with a few small trees, and herbaceous vegetation along the upland portion of the canal shoreline. To maximize the riparian zone benefits, it would actually consist of two stories of habitats. The bottom story would consist of herbaceous plants while the upper story would consist of various types of shrubs and possibly a few small trees. The riparian zone would extend on a slope from above the water line, along the upland. It would be parallel to the canal and littoral shelf. The alternatives for this concept are various slopes and widths of the riparian zone.

4.3.1 Size Variations

The major consideration of this alternative was variations in size. These variations ranged from 5 to 15 feet in width.

4.4 Upland Hammocks

Upland hammocks would consist of a blend of upland vegetation that historically occurred in the area. Hammocks in this case means selective groupings of upland plants. It was determined by the planning team that numerous, relatively small, multi-canopied hammocks made the most ecological sense for this project.

4.5 Significance of Habitat

Significance of habitat and cost are the two main factors used in plan formulation and selection of alternatives, including. the preferred alternative.

4.5.1 Significance of Littoral Zone

As noted earlier, the most ecologically significant habit that could be constructed in this watershed is the littoral shelf ecosystem.

4.5.2 Significance of Littoral Zone combined with Riparian Zone

Selection of the littoral ledge concept as the central component of the ecosystem restoration plan led to further, more comprehensive, development of the riparian zone concept. This is because in combination, the riparian zone can make the extremely productive littoral ecosystem even more productive. Restoring riparian vegetation along natural waterways from where it had been removed can provide great ecosystem benefits and this type of restoration project has increased dramatically throughout the country. However, in Snake Creek Canal, the benefits attributable to the riparian zone would not be as significant if it was not combined with a littoral zone. The reason for this is that a major benefit of the riparian zone, is the detrital matter it contributes to a waterways foodweb. Detritus, which is the plant matter that falls into the canal together with the microbes that cover and consume it, must have a vibrant ecosystem to incorporate it into the food web. This would be the case where there is a natural stream with a functioning ecosystem and the only major impairment had been the removal of the riparian vegetation. That is not the case with this relatively deep canal The littoral zone would provide the vibrant ecosystem that could readily absorb the detrital matter originating from the riparian zone. Without a shallow water ledge, much of the plant matter from the riparian zone would simply accumulate on the relatively oxygen-poor bottom of the deep canal as organic muck. This muck may be periodically removed during maintenance of the canal, or be flushed into Biscayne Bay to the possible detriment of

water quality there. In combination with a littoral ledge, detrital contributions from the riparian zone would be quickly assimilated into this highly productive ecosystem. As a transition area between aquatic habitat and wetlands and the dry terrestrial areas along the canal right of way, the riparian zone will also contribute to tremendous diversity of fauna. Corps policy on ecosystem restoration (EP 1165-2-502) encourages the use of an integrated approach so that the interconnectedness and dynamics of natural systems will be incorporated into the plan where possible and justified. The riparian zone, as a transition between wetlands and uplands, does that. The vegetative planting plan is contained in Appendix I.

4.5.3 Significance of Upland Hammocks

Historically, upland habitat consisted primarily of slash pines with a very diverse understory of shrubs, palms and herbs, many of which only occurred in South Florida. Native species will be planted in the dry portion of the riparian zone and in 42 separate upland hammocks. These upland hammocks would be reminiscent of habitats that occurred here historically. Limitations due to extent of right of way, need for maintenance equipment access to the canal and an open visual zone for security in this highly urban setting, upland hammock planting of will be minimal. The vegetative planting plan is contained in Appendix VI.

4.6 Construction and Planting Costs

All work associated with construction of the littoral shelves, including, excavation and shaping, preparation of the disposal area and disposal of the excavated material would cost approximately $47,000 for all alternatives due to the high cost of mobilization and demobilization. Planting costs for littoral shelves, riparian zone and upland hammocks would average about $35,000 per acre. Costs associated with planting, including placement of planting substrate on the littoral shelves, watering of upland plants and post project monitoring, would raise the planting cost by about $6,000 per acre. Detailed planting costs are presented in Appendix VI and summarized below.

4.6.1 Summary of Planting Alternatives

The conceptual design of this ecosystem restoration project is defined by the restrictions of a narrow right of way and the need to retain 100 foot long, unmodified, sections of shoreline for canal maintenance, every 300 feet. Therefore, to optimize available shoreline space, all littoral shelf and riparian zone segments will be 300 feet long and only vary in width. The relatively narrow right of way and the requirement of leaving sufficient open area for maintenance equipment to have access to the canal, significantly restricts the width of the littoral shelves and riparian zones. The upland hammocks, which are considered much less ecologically valuable than the littoral shelves and riparian zone, fill in the remainder of the right of way.

Planting options and costs are presented in Appendix VI. The recommended planting plan uses the industry standard for ecosystem restoration projects, which is the least cost method for achieving about 85 to 90 percent success from initial plant installation.

4.7 Summary of Outdoor Recreation Alternatives

The environmentaly oriented recreational component for this project consists primarily of a 21,000 foot long (almost 4 miles) nature trail, forty six(46) benches and eight (8) interpretative signs. A small rustic bridge would be constructed where the trail crosses a small, perpendicular canal. In accordance with Corps guidance the cost of the recreation component is limited to 10% of Federal project cost and is cost shared 50-50 with the project partner, the SFWMD. Detailed plan is presented in Appendix VIII**.** Selection of the type of material that would be used for trail construction is presented in Section 5.

4.8 Disposal of Excavated Material

Extensive mining for limestone rock occurs in the region particularly Dade County. Products include asphalt, cement, and rock that is used as road-base, rip rap, and in various types of drainage fields. Dade County produces more than half the construction grade rock used in the entire State of Florida. With such a rock-mining infrastructure in place it is highly probable that some or all of the excavated material would be disposed of at no cost to the project. This will be explored further during the Plans and Specifications phase of the project. For cost analysis purposes during this phase of the study, it was presumed that all of the excavated material would be spread in appropriate places throughout the right of way.

5 SELECTION OF PREFERRED ALTERNATIVE

5.1 Description of Alternatives

5.1.1 No-Action Alternative

This alternative was not selected since it would not achieve the planning objectives.

5.1.2 Alternative 5

This alternative consists of **gradual sloped littoral shelves** 15 to 30-foot wide with a 10 to 15-foot wide riparian zone. Shelves would be 300-foot long separated by 100-foot of unmodified canal shoreline and alternate from canal side to side. The excavated shelf bottom would slope to a 2 to 3-foot water depth and be varied slightly for a more natural bottom finish. The excavated material would be placed and planted for habitat within the ROW or disposed of at the local landfill. A contractor option is also being considered for beneficial uses of excavated material. The shelf pattern would repeat itself along the northern side of C-9 from NW 37th Ave. to the Florida Turnpike for about 11,000 feet. The southern side of C-9 would receive the same treatment within the same project boundaries for a distance of about 10,500 feet. One hundred foot no planting areas for maintenance access would be provided for all existing canals and bridges.

The shelves would be planted with native shoreline, emergent and submergent vegetation. The upland areas would also be planted with native plants to provide upland habitat. Native tree clusters adjacent to the ROW edge are proposed for bird nesting and roosting areas. This alternative would provide the greatest environmental habitat outputs at the greatest cost. An 8-foot wide, ground level, asphalt nature trail is proposed to harmoniously blend with the restoration project and take advantage of the interpretive opportunity. Educational signage that illustrates and explains historic wetland habitat and the proposed project goals and objectives would be installed for trail users to read and observe.

Seating near the littoral areas would be installed. Freshwater bank fishing access would be accommodated. An austere footbridge would span the drainage canal that intersects C-9 in the southwest segment between NW 37th Ave. and NW 27th Ave. The nature oriented recreation component would help alleviate some State of Florida, Statewide Comprehensive Outdoor Recreation Plan (SCORP) deficits for nature study, trails and freshwater bank fishing in the south Florida Region XI area (SCORP, 2000).

5.1.3 Alternative 6

This alternative consists of **terraced littoral shelves** 15-foot wide with a 10-foot wide riparian zone and tree habitat. Shelves would be 300 feet long, separated by 100-foot of unmodified canal edge. The pattern would repeat itself along the northern side of C-9 canal from 37th Ave.

eastward to the Florida Parkway for a distance of approximately 11,000-foot. This pattern repeats itself along the southern side of C-9 canal from 37th Ave. eastward to the Florida Turnpike for a distance of approximately 10,000-foot.

Terraced depths of the littoral shelves would contain five subsections that would be 60-foot long by 15-foot wide. Each subsection would have a uniform depth of 1-foot, 2-foot, 3-foot, 2-foot, and 1-foot below mean water. The slope from the water's edge to the upland would be similar to the existing slope. There would be small but relatively steep transition between the unmodified areas and the subsections with steps between subsections for a total distance of approximately 21,000 linear feet. The same native plantings (littoral shelf, riparian zone and tree groupings) are proposed as is the same ancillary recreation component.

5.1.4 Alternative 5a

This alternative consists of **gradual sloped littoral shelves** 10-foot wide with a 5-foot wide riparian zone. Shelves would be 300-foot long, separated by 100-foot of unmodified canal edge. The pattern would repeat itself along the northern side of C-9 canal from NW 37th Ave. eastward to the Florida Turnpike. Distance is approximately 11,000-foot. This pattern repeats itself along the southern side of C-9 canal from 37th Ave. eastward to the Florida Turnpike for a distance of approximately 10,000 feet.

The littoral shelves would slope to the existing canal waters in a gradual manner to a depth of approximately 2-foot below mean high water. As the shelves sloped to deeper water various shoreline, emergent and submergent native plant materials would be planted for environmental habitat improvements along approximately 21,000 linear feet. The same native plantings (for the littoral shelf, riparian zone and tree groupings), and ancillary recreation component are proposed.

5.1.5 Alternative 6a

This alternative consists of terraced littoral shelves 10-foot wide with a 5-foot wide riparian zone. Shelves would be 300-foot long, separated by 100-foot of unmodified canal edge. The pattern would repeat itself along the northern side of C-9 canal from 37th Ave. eastward to the Florida Turnpike for a total distance of approximately 10,500-feet. This pattern repeats itself along the southern side of C-9 , from 37th Ave. eastward to the Florida Turnpike, for a total distance on both sides of the canal, of approximately 21,000-feet.

Terraced depths of the littoral shelves would contain five subsections that are 60-foot long by 10-foot wide. Each subsection would have a uniform depth of 1-foot, 2-foot, 3-foot, 2-foot, and 1-foot below mean water. The slope from the water's edge to the upland would be similar to the existing slope. There would be small but relatively steep transition between the unmodified areas and the subsections with steps between subsections for a distance of 21,000 linear feet. The same native plantings (for the littoral shelf, riparian zone and tree groupings), are proposed as in Alternative 5.

5.2 Recreational Component

The recreational component would consist of a nature trail with a small bridge, benches and interpretative signs. The Federal contribution to the recreational component is essentially limited to 10 percent of the total Federal cost for the project. The recreational component is cost shared with the sponsor 50-50. The most cost effective plan was developed within the Corps policy on recreation associated with an ecosystem restoration project.

Since the recreational component is limited by Corps policy so that it can not increase the Corps share of the project cost by more than 10 percent, not all alternatives will have all the elements of the proposed recreational plan.

The most significant issue about the recreational plan, besides a pedestrian bridge, was a decision regarding the type of material that would be used to construct the trail. This is discussed below.

5.2.1 Trail Material

Several different materials were considered for constructing the nature trail. Costs and benefits of different trail construction materials are summarized in the table below. After considerable deliberations the team decided that the recommended material should be asphalt because of its relatively low cost over the long term. It is also more desirable than the more environmental friendly options of mulch or crushed rock because it can accommodate more diverse uses such as rollerblading and skateboarding and is better suited for street bicycles. This is appropriate for a project located in a highly urban area. Asphalt is also consistent with the regional plans for trails and bikeways. An asphalt trail will not impede hydrology or cause local pooling of water because the adjacent limestone is highly porous. Regardless of the material used, the trail will not have an adverse impact on the wildlife that will benefit from the ecosystem restoration project, except, perhaps for occasional disturbance. See Table 2 for comparison matrix.

TABLE 3: TRAIL MATERIAL COMPARISON

SURFACE MATERIAL	EXPECTED LIFE-SPAN	MAINT. COSTS RATE	ADA COMPILANT	DRAINAGE CHARACTER	USE - COMFORT	INITIAL COSTS	MULTI-USE FUNCTION
CONCRETE	LONGEST	LEAST - lowest	YES	GOOD	LOW	$13 - $15	GOOD
#ASPHALT	2nd BEST	2ND BEST – (reseal every 7 years)	YES	GOOD	GOOD	$7 - $9	BEST
CRUSHED SHELL	GOOD	GOOD – minimal annual	YES	GOOD	GOOD	$6 - $8	AVERAGE (no rollerblades, skateboards)
MULCH	POOR	HIGH – after each rain	NO	POOR	GOOD	$5 - $7	POOR
SOIL STABILIZER	GOOD	FAIR – after each rain	YES (WHEN DRY)	GOOD	FAIR	$15 - $20	GOOD (except after rain.)
URETHANE RUBBER	FAIR	GOOD – minimal annual	YES	GOOD	BEST	$15 - $20	AVERAGE (poor for bikes, etc.)

A more detailed explaination of this table is contained in Appendix VIII.

5.2.2 Benches, Signs and Bank Fishing

The benches and signs will promote the well being of the nature trail users. The number of benches and signs proposed for this project is considered to be the most cost effective based on available space and projected usage. No special provisions are proposed for bank fishing. It is

expected that the riparian zone will discourage fishing in that area which will protect the vegetation on the littoral shelves. The unmodified 100 foot segments between littoral shelves should prove to be good places to fish.

5.3 Alternative Analysis

Different restoration alternatives were originally considered that included various littoral shelf widths, lengths, depths, plant materials and locations in the C-9 ROW. Several ancillary recreation trail widths were also considered. All four (4) of the ecosystem restoration alternatives are a best buy because of the way they were formulated within the project area space restrictions. However, one of these alternatives will be better than the others and this section narrows down the alternatives to one (1), the Preferred Alternative.

5.3.1 Principals and Guidelines

National Environmental Policy Act requires that no action always be considered a viable alternative in any final array of plans. The Corps would only become involved in a project if doing something is better for society than doing nothing. If it is found that one or more plans warrant consideration over the no action plan, the selection criteria favors a plan that is cost effective and for ecosystem restoration, subjectively maximizes net benefits. The Principles and Guidelines established four accounts to facilitate evaluation and the display of the effects of alternative plans. These accounts are national economic development (**NED**), regional economic development (**RED**), environmental quality (**EQ**), and other social effects (**OSE**).

The NED account is the account that includes estimates of project benefits and costs used to calculate net economic benefits, upon which, the economic feasibility of plans rests. Net benefits is defined as average annual equivalent benefits minus average annual equivalent costs. The NED plan is the plan that maximizes net benefits, not necessarily the plan with the greatest benefit Cost Ratio (BCR = B/C). While an ecosystem restoration project is not required to meet the NED requirement per se, it must meet the criteria in spirit, i.e. maximizing net benefits. The problem comes from the difficulty in quantifying environmental benefits, often referred to as outputs. The RED account registers changes in the distribution of regional economic activity that result from each alternative plan. Two measures of the effects of the plan on regional economics are used in the account: regional income and regional employment. No real net effect on regional economic development is expected to result from implementation of this plan. Beneficial effects in the EQ account are favorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources. The OSE account lends the system of four accounts the flexibility to address any effects that are judged significant. This is the account that reflects anything that affects the well being of people.

5.3.2 Meeting the Objectives

Table 4 summarizes how well the No Action Alternative, and the four (4) remaining ecosystem restoration alternatives meet the objectives. The alternatives that best meet the objectives are ranked with number one (1) being the best. Alternative 5 best meets all of the planning objectives.

5.3.3 Most Cost Effective Alternative

Cost effectiveness and ecological performance where the primary guiding principals in the plan formulation process. In the beginning, pond and lagoon concepts were dropped because they would have been about twice as expensive as the littoral ledge approach, while providing only a fraction of the ecosystem benefits of the latter. The four remaining littoral shelf alternatives were further analyzed for cost effectiveness. Alternative 5 provides the best overall return for the cost.

5.3.4 Getting the Most Ecosystem Value for the Cost

As is evident from Tables 4 and 5, Alternative 5 provides the most ecosystem value for the cost.

5.3.5 Incremental Cost Analysis

For the littoral ledge and riparian zone alternatives, the incremental costs are proportionate with the benefits. (It should be noted that the riparian zone alternative would yield significantly less environmental benefits relative to the costs as a stand-alone project than one coupled with the littoral ledge. Conversely the littoral ledge productivity would be diminished without the riparian vegetation). If there were no constraints on the ecosystem restoration project, a detailed analysis of the littoral ledge alternative would probably yield a sharp increase in incremental cost at some point. However, due to the constraints of ROW, land requirements for maintenance equipment access and need to keep sections of the canal bank unmodified, such an incremental analysis was not necessary though a form of incremental analysis was performed anyway. Once the optimum design of the littoral ledge was established, it was combined with other project features and these were further analyzed as alternatives. The final plan formulation iterations refined the project to four alternatives and then continued to select the one that provided the best overall ecosystem returns for the expenditure of public funds. An analysis of costs and relative ecosystem benefits, Table 4, demonstrates that Alternative 5 provides the best overall environmental return for the cost. Table 5 is an analysis of relative ecosystem outputs of the remaining alternatives. As is evident from Tables 2, 4 and 5, Alternative 5 is also justified from an incremental analysis perspective.

As can be seen in Table 2 and 4, while all remaining alternatives perform valuable functions and meet the objectives, Alternative 5 ranked the highest in benefits over the other three (3) alternatives while still being the lowest in per unit cost.

5.3.6 Other Environmental Impacts of Alternatives

5.3.6.1 Water Quality

All four alternatives would have long term beneficial impact on water quality. Alternative 5 would have the best long term water quality impacts because it contains the greatest area of littoral ledge habitat. Small construct impacts would be about the same for all alternatives and would be relatively minor and short term.

5.3.6.2 Threatened, Endangered and Species of Special Concern

Impacts from all alternatives would be about the same during construction since the same standard precautions would be taken to reduce potential harm to listed species. Long term benefits to listed wading bird species would be greater from Alternative A because it contains more littoral ledge.

5.3.6.3 Birds

Birds would benefit significantly from all alternatives. Alternative 5 would provide the best overall habitat for passerine and wading birds.

5.3.6.4 Hazardous, Toxic and Radioactive Wastes (HTRW)

The material to be excavated is native limestone rock with a soil component consisting primarily of decayed limestone and an organic matter mix from decomposed local plants. Some the top layer is made up of material excavated from the canal. The ROW is maintained in a grassy vegetation mix. A survey of the site confirmed that no HTRW material was located at this site.

Impacts would be the same from all alternatives.

5.3.6.5 Hydrology and Pedestrian Bridge

A small pedestrian bridge is planned as part of the nature trail. It would span a lateral canal that drains into C-9 Canal. A brief description of such a bridge is contained in Appendix VIII. The Corps will not construct, or allow others to construct, a bridge at this site if it has a significant adverse impact on hydrology and/or hydraulics. The littoral shelf construction and associated plantings will not have an adverse impact on canal hydrology and/or hydraulics.

Table 4: Alternative Comparison and Environmental Impact Summary

	ALTERNATIVES					
	No Action	**Alts 1-4**	**Alt 5**	**Alt 6**	**Alt 5a**	**Alt 6a**
1. PLAN DESCRIPTION	See text	Screened (see text)	Gradual Slope, Wide Shelf	Terraced Slope, Wide Shelf	Gradual Slope, Narrow Shelf	Terraced Slope, Narrow Shelf
2. IMPACT ASSESSMENT						
A. National Economic Development (NED)						
Estimated Construction Cost	$0		$1,646,300	$1,345,700	$1,128,500	$1,119,900
Littoral shelf restored (Ac)	0		10.3	5.7	3.3	2.8
Riparian zone restored (Ac)	0		4.9	3.3	1.6	1.6
Upland hammocks(Ac)	0		1.5	1.5	1.5	1.5
Total habitat restored (Ac)	0		16.7	10.5	6.4	5.9
Cost per acres restored ($/Ac)			$98,581	$156,790	$176,328	$189,814
Benefit to Cost Ratio			Benefits not monetized	Benefits not monetized	Benefits not monetized	Benefits not monetized
RANK:		N/A	1	2	4	3
B. Environmental Quality (EQ)						
(1) Air/Noise	No change		No long term change. Short term adverse effects during construction.	No long term change. Short term adverse effects during construction.	No long term change. Short term adverse effects during construction.	No long term change. Short term adverse effects during construction.
(2) Water Quality	No change		Best localized benefits.	Second best localized benefits.	Third best localized benefits.	Fourth best localized benefits.
(3) Vegetation	No change		Largest area of restored	Second largest area	Third largest area of restored	Smallest area of restored

			native vegetation. Gradual slope allows for better adjustments of plant community to water level.	of restored native vegetation. Terraces may restrict plant community succession.	native vegetation. Gradual slope allows for better adjustment of plant community to water level.	native vegetation. Terraces may restrict plant community succession.
(4) Threatened and Endangered Species	No change		No adverse impacts to manatee or indigo snake. Largest gain of foraging area for wood stork.	No adverse impacts to manatee or indigo snake. Second largest gain of foraging area for wood stork.	No adverse impacts to manatee or indigo snake. Third largest gain of foraging area for wood stork.	No adverse impacts to manatee or indigo snake. Smallest gain of foraging area for wood stork.
(5) Wading Birds	No change		Restores largest area of shallow water foraging habitat.	Restores second largest area of shallow water foraging habitat.	Restores third largest area of shallow water foraging habitat.	Restores smallest area of shallow water foraging habitat.
(6) Cultural Resources & Historic Properties	No change		No Adverse Effects	No Adverse Effects	No Adverse Effects	No Adverse Effects
RANK:		N/A	1	2	3	4
C. Regional Economic Development (RED)	No net effect					
D. Other Social Effects (OSE)						
Life, Health and Safety	No change. Deep water adjacent to shoreline.		Reduced risk of drowning because edge of water is shallow rather than deep.	Reduced risk of drowning because edge of water is shallow rather than deep.	Reduced risk of drowning because edge of water is shallow rather than deep.	Reduced risk of drowning because edge of water is shallow rather than deep.
Environmental Justice	No change		No adverse impacts. Provides ecosystem and recreation benefits to low income populations.	No adverse impacts. Provides ecosystem and recreation benefits to low income populations.	No adverse impacts. Provides ecosystem and recreation benefits to low income populations.	No adverse impacts. Provides ecosystem and recreation benefits to low income populations.

Recreation	No change		21,000 feet of multi-use trail. Greatest restored area to use for education/ interpretation.	16,000 feet of multi-use trail, benches and signs. Second largest restored area to use for education/ interpretation.	10,500 feet of multi-use trail, benches and signs. Third largest restored area to use for education/ interpretation.	10,500 feet of multi-use trail, benches and signs. Smallest restored area to use for education/ interpretation.
RANK:		N/A	1	2	3	4
	ALTERNATIVES					
	No Action	**Alts 1-4**	**Alt 5**	**Alt 6**	**Alt 5a**	**Alt 6a**
	See text	Screened (see text)	Gradual Slope, Wide Shelf	Terraced Slope, Wide Shelf	Gradual Slope, Narrow Shelf	Terraced Slope, Narrow Shelf
A. Contribution to Planning Objectives						
(1) Improve habitat for wading birds			1	2	3	4
(2) Provide nursery habitat for fish and invertebrates			1	2	3	4
(3) Increase diversity of shoreline			1	2	3	4
(4) Plant native vegetation			1	2	3	4
(5) Provide recreation facilities			1	1	1	1
RANK:			1	2	4	3
B. Response to Planning Constraints						
Financial capability of local partners to cost-share project construction			Sponsor capable. 1	Sponsor capable. 1	Sponsor capable. 1	Sponsor capable. 1
Do not reduce flood protection			No reduction. 1	No reduction. 1	No reduction. 1	No reduction. 1
Do not increase salt water intrusion			No increase. 1	No increase. 1	No increase. 1	No increase. 1
Do not harm Federal listed species			No harm. 1	No harm. 1	No harm. 1	No harm. 1
Stay within existing ROW			Stays within ROW. 1	Stays within ROW. 1	Stays within ROW. 1	Stays within ROW. 1

Allow for routine and emergency maintenance			Maintenance access allowed. 1	Maintenance access allowed. 1	Maintenance access allowed. 1	Maintenance access allowed. 1
RANK:		N/A	1	1	1	1
C. Response to Evaluation Criteria						
Institutional acceptability			Most acceptable. 1	Acceptable. 3	Acceptable. 2	Acceptable. 4
Public acceptability			Acceptable. 1	Acceptable. 1	Acceptable. 1	Acceptable. 1
Completeness			Complete. 1	Complete. 1	Complete. 1	Complete. 1
Effectiveness			Effective. Meets objectives. Largest amount of benefits. 1	Effective. Meets objectives. Second largest amount of benefits. 2	Effective. Meets objectives. Fourth largest amount of benefits. 4	Effective. Meets objectives. Third largest amount of benefits. 3
Efficiency			Lowest cost per unit output. 1	Second lowest cost per unit output. 2	Third lowest cost per unit output. 3	Highest cost per unit output. 4
RANK:			1	2	3	4

Note: Costs of alternatives in Table 4 do not include costs associated with planning or preparation of this report. They also do not include the costs of the recreation components of the alternatives.

5.3.7 Relative Ecological Value

Another approach at selecting the best alternative is to look at the relative ecological value, or significance, of the habitat types that are being considered and then rank the alternatives that provide the best combination of these values. This is displayed in Table 5.

Relative eco-value is essentially a method that uses best professional judgment to rank the ecological value of the various habitats that are being considered. The littoral ledges are ranked the highest because they represent the best and most significant habitat that can be constructed in this project area. Riparian zone is the next best habitat and is scored higher than it otherwise might be because of its association with the littoral ledge ecosystem. Both the overstory and the understory riparian zone vegetation are scored the same because they each have the same relative benefits, though their ecological functions are somewhat different. Upland hammocks are scored half of the littoral zone relative value, which is a little high for upland communities, but justified in this case since this habitat will be provided in groupings and have an understory of native shrubs, palms and ground cover. Planting indigenous species will further raise its relative. While lowest on the ranking scale, barren areas do have some limited value. The cost /REV unit is only meaningful when comparing this set of alternatives. It can not be used as a monitory value of the habitat since there are numerous other project outputs, such as birds, fish, reptiles and numerous other categories of animal and plant species that will benefit from this project. Furthermore, any range of numeric values could have been used instead of one (1) through ten

TABLE 5: RELATIVE ECO-VALUE OUTPUT OF ALTERNATIVES

HABITAT	RELATIVE ECO-VALUE (REV)	ALTERNATIVES							
		5		6		5a		6a	
		ACRES	REV	ACRES	REV	ACRES	REV	ACRES	REV
Littoral Shelf	10	10.3	103	5.7	57	3.3	33	2.8	28
Riparian Zone Overstory	7.5	4.9	37	3.3	25	1.6	12	1.6	12
Riparian Zone Understory	7.5	4.9	37	3.3	25	1.6	12	1.6	12
Upland Hammocks	5	1.5	8	1.5	8	1.5	8	1.5	8
Just Upland Trees	3	NA	NA	NA	NA	NA	NA	NA	NA
Just Upland Shrubs	3	NA	NA	NA	NA	NA	NA	NA	NA
Total REV			185		115		65		60
Alternatives Cost (X 1,000)		$1,646		$1,346		$1,129		$1,119	
Cost / REV unit			$8.9/ REVu		$11.7/ REVu		$17.4/ REVu		$18.7/ REVu

(10) thereby greatly altering the cost /REV unit value, but not changing the ranking of the alternatives.

5.4 Preferred Alternative

Alternative 5, the Gradual Slope Littoral Shelf and Riparian Zone has been determined by the project interdisciplinary study team to be the preferred alternative. This recommendation is based on the construction and life-cycle costs and projected environmental benefits relative to costs. Operation and maintenance costs over the project life would be less for the preferred alternative. Project success rates would be higher with a much smaller chance of significant erosion. There would be less material to excavate. The littoral shelves would not be as steep as for most of the Terraced Littoral Shelf Alternative.

6 SUMMARY OF RECOMMENDED PLAN

The Preferred Alternative is the Recommended Plan.
This section provides a detailed summary of the Recommended Plan including dimensions, quantity of material to be excavated, numbers of plants to be planted and costs. Figure 3 provides a typical plan view of the proposed project

6.1 Dimensions

6.1.1 Project Area and Length

The project area extends from NW 37th Ave. to the Florida Turnpike as shown in Figure 2. NW 27th Ave. crosses approximately in the middle of the project length, and therefore can be used to conveniently divided the project into four segments, which are designated by their geographic orientation of NE, NW, SE and SW. See Figures 1 and 2 for location and orientation of the project area. Project is about 10,500 feet long on both sides of the canal for a total project length of approximately 21,000 feet, or almost four (4) miles.

6.1.2 Project Area Width and Depth of Canal

The width of the canal is 175 feet at the top, 110 feet at the bottom and 150 feet at the actual water surface, which is generally 5 feet from the top of the canal. See cover of report. The water control structure. S-29, located 500 feet downstream of US Highway 1, maintains a fairly constant water level in the canal, except after very heavy rains in the watershed. Normal water depth in the project area is 19 feet. The right of way lands, which include the canal, vary from 335 to 365 feet wide. That leaves between 92 feet and 107 feet of land between the end of the right of way and the normal water surface level, on either side of the canal, for potential habitat restoration. The right of way lands are fenced and which has helped prevent residential encroachment into the project area.

6.1.3 Littoral Shelf Dimensions

There would be approximately 52 littoral shelves, each would be 300 feet long and between 15 and 30 feet wide, depending on the right of way width and other restrictions. Most littoral shelves would be 30 feet wide. The littoral shelves would be between two and three feet deep at the deepest end (2 feet is the preferred depth) and gradually slope upwards towards the shore. Figure 4 shows a typical profile view of the proposed project. About **65,000 cubic yards of material would be excavated** to form the littoral shelves. About 17,000 cubic yards of the excavated material, that portion which contains at least one percent (1%) organic matter, would be placed on the newly excavated littoral shelves within the canal. The organic matter in this material will lower the pH to the level preferred by the wetland plants. The added material, which would be about one foot deep, will also provide a more suitable planting substrate than the limestone rock and rubble. The remainder of the excavated material would be spread along the right of way.

6.1.4 Riparian Zone Dimensions

The riparian zone would consist of approximately 52 segments, each of which would be 300 feet long and between 10 and 15 feet wide. Width would depend on restrictions such as right of way and access for maintenance equipment. The riparian zone would be constructed adjacent to the littoral shelves. A width ratio of 2 feet littoral shelf to 1 foot of riparian zone would be maintained in order to maximize ecological productivity.

6.1.5 Upland Hammocks

There would be 42 upland hammocks with each one covering about 1,500 square feet.

6.2 Planting Summary

Over 83,000 plants would be planted as part of this ecosystem restoration project.

6.2.1 Littoral Shelves

Approximately 500 wetland plants would be planted on each 15 feet wide 300 feet long, littoral shelf segment and twice that number for each 30 feet wide littoral shelf. Width of littoral shelves would be determined by restrictions such as the extent of the right of way and requirements for maintenance access. A total of about 49,400 wetland plants would be planted on the 10.3 acres of littoral shelves that would be constructed as part of this project. Care will be taken to plant the proper plant species at the proper water depth. The total littoral shelf planting cost is estimated to be $110,600.

6.2.2 Riparian Zone

The riparian zone would actually be two storied or two tiered. The upper tier would consist of various sized shrubs while the lower story would consist of herbaceous plants.

6.2.2.1 Upper Tier; Shrubs

Approximately 1,320 shrubs would be planted on each 10 feet wide 300 feet long, riparian zone segment and 1,980 shrubs for each 15 feet wide by 300 feet long riparian zone segment. Width of littoral shelves would be determined by restrictions such as the extent of the right of way, requirements for maintenance access and ratio of riparian zone habitat to littoral shelf habitat. A total of about 9,500 shrubs would be planted on the 4.9 acres of riparian zone. The total cost of planting 4.9 acres of the upper tier riparian zone is estimated to be $188,672.

6.2.2.2 Lower Tier; Herbaceous Plants

The lower tier of the riparian zone would consist of about 334 plants for a 10 feet wide by 300 feet long segment and about 500 plants for a 15 feet wide by 300 feet long segment. Width of littoral shelves would be determined by restrictions such as the extent of the right of way, requirements for maintenance access and ratio of riparian zone habitat to littoral shelf habitat. Planting the 4.9 acres of lower tier riparian zone would require about 22,900 plants and cost $240,128.

6.2.3 Upland Hammocks

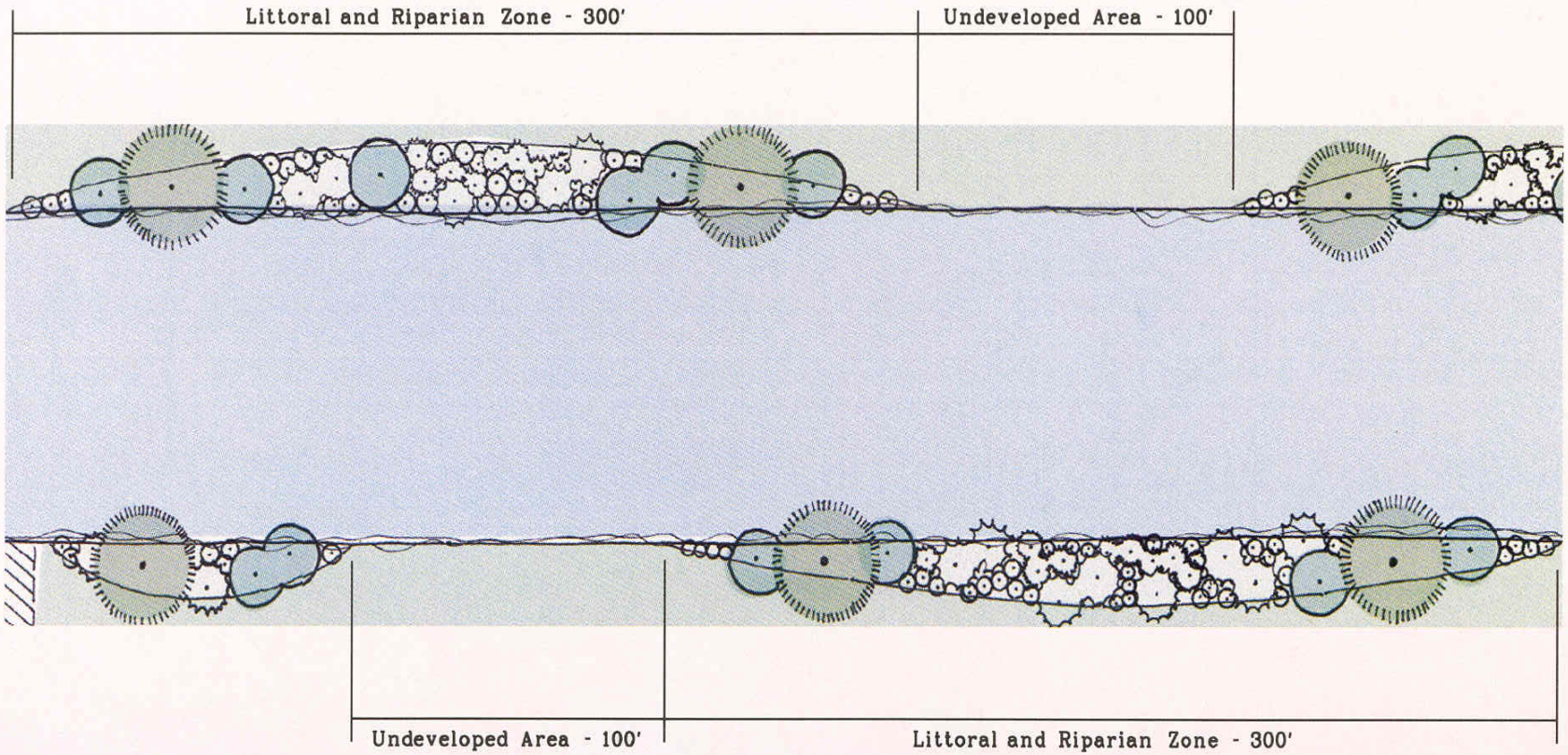
There would be 42 upland hammocks consisting of an assortment of about 35 different plant species including tall grasses, shrubs and trees. The planting cost per upland hammock is estimated to be about $823. The 1.5 acres of upland hammocks would consist of about 1,500 plants and cost a total of about $35,400.

6.3 Recreational Component

The main feature of the recreational component would be a 21,000 foot long nature trail that would be 8 feet wide and cost about $250,400. A narrow pedestrian bridge would be required to span a relatively small lateral canal if the nature trail was to be continuous. The pre-fabricated bridge would cost $123,100 and require an additional $143,400 for abutment dewatering and other related construction costs.

CANAL 9 (SNAKE CREEK CANAL)

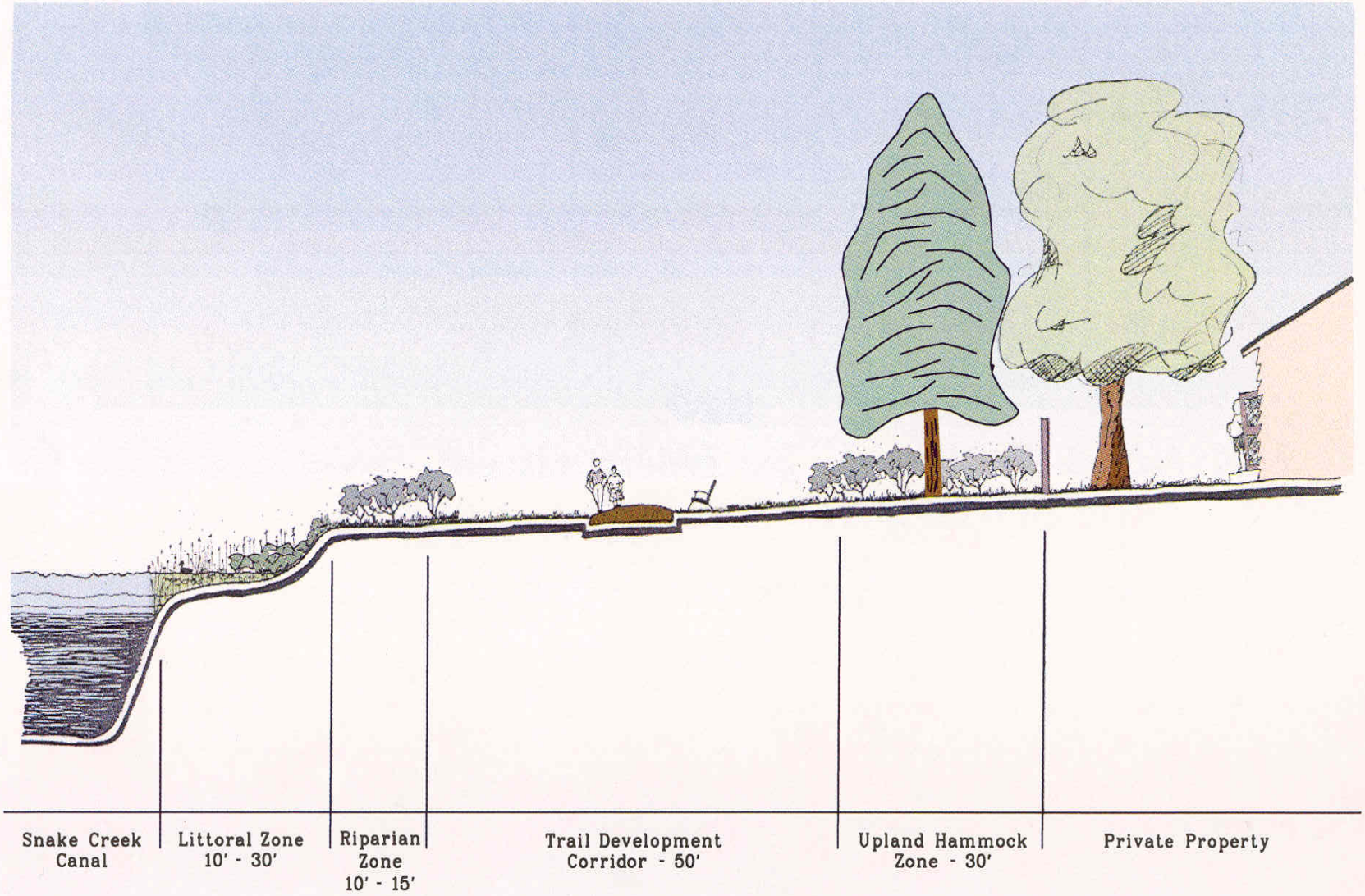
Section 1135 Environmental Restoration Report



TYPICAL PLAN VIEW

CANAL 9 (SNAKE CREEK CANAL)

Section 1135 Environmental Restoration Report



TYPICAL PROFILE VIEW

Forty six interpretative signs would cost a total of $12,650 and 46 benches would cost a total of $39,100. The trail, signs and 36 of the proposed 46 benches would be cost shared 50-50 between the Corps and the project partner. The bridge and 10 benches would be funded 100 percent by the project partner. Costs of the recreation component and the overall project cost are shown in Table 6.

Total cost of the recreational component would be $527,700. Corps policy limits the project cost increase due to a recreational component to no more than 10% of the Federal cost. Therefore the corps contribution to the recreation component will be limited to the nature trail. The bridge, benches and interpretive signs would be a locally preferred option and would be funded at 100 percent non-Corps cost.

TABLE 6: COST OF RECREATION

FEATURE	TOTAL COST	FEDERAL	NON-FEDERAL
Non-Recreational (Planning, construction etc.)	$1,961,400	$1,471,050	$490,350
Recreation			
Cost Shared (50/50)	$294,210	$147,05	$147,05
Locally Preferred (100%)	$266,500		$266,500
TOTAL•:	**$2,489,000**	**$1,618,155**	**$870,945**

6.4 Consistency with Project Purpose

The Recommended Plan is in accordance with Section 1135 authority, the modifications are feasible and consistent with the authorized project purposes.

6.5 Assumptions and Uncertainties

Assumptions are that the proposed ecosystem restoration project will be as successful as other similar projects in Florida have been in the past. The planting methods and costs are based on the industry standards for such projects. The only uncertainty at this time is whether the pedestrian bridge will be constructed as part of this overall project.

7 ENVIRONMENTAL OUTPUTS AND OTHER BENEFITS

Now that the alternative which provides the best return for the expenditure of funds has been determined (Recommended Plan), the next question that must be addressed is whether the proposed action would provide sufficient benefits to justify the cost? One way of accomplishing this would be to quantify, as much as possible, the environmental outputs of the proposed project. Since most of the impacts of an ecosystem restoration project are the same as environmental outputs these have been elaborated on in this section.

7.1 Environmental Outputs

7.1.1 Wetlands

The preferred plan will restore about 450,000 square feet, 10.3 acres, of extremely valuable littoral wetlands. In order to attain the maximum benefits, the project will strive to attain heterogeneity by having different water depths throughout the littoral ledge. This corresponding plant species diversity will create even greater habitat diversity for aquatic invertebrates and fish species. Currently the only wetlands of significance in the entire Snake Creek Canal watershed is an intermittent fringe of some wetland plants that has managed to become established along the

edge of the canals steep slopes. The project will increase the wetland acreage in the Snake Creek Canal watershed by an order of magnitude. As can be seen in Table 4 and 5, the preferred alternative provides almost twice as much of this important habitat than Alternative 6 and three times as much as Alternative 5A and 6A. Because of the year long growing season, these wetlands should produce large quantities of biomass to feed the aquatic and avian food chains.

7.1.2 Riparian Habitat

There is currently no discernible riparian vegetation adjacent to the canal. Desirable shrub species will be planted along the dry and transitional area around the water line. A total of 43,560 square feet (4.84 acres) will be planted in 47 segments that are each about 300 feet long and 15 feet wide. The riparian habitat would therefore cover almost three quarters of the of total canal length in the project area. The SFWMD needs the remainder of the canal ROW left intact so that they can continue proper maintenance of the canal. See Appendix VI and the Fish and Wildlife Coordination Act Report in Appendix III, for more information about potential shrubs and other vegetation that could be planted in the riparian zone. Numerous endemic species of plants were found historically in this area, many of which were not found elsewhere in Florida. To the extent practical, these endemic species will be used in this ecosystem restoration project. The riparian habitat will help improve water quality by intersecting sediments, removing nutrients and reducing near-shore water temperature. It would contribute to the food web through detritus input and provide habitat for reptiles, small birds and other wildlife. This riparian zone would be a haven to many beneficial, colorful and very interesting insects. The educational and ecosystem value of this riparian zone will only be surpassed by that of the littoral zone.

7.1.3 Upland Hammocks

Historically the upland area adjacent to Snake Creek (C-9) consisted of a vast expanse of subtropical pinelands interspersed with wet, moist and dry hammocks. About 30 percent of the species that occurred in this wide array of hammock and pineland communities contained endemic species that occurred no where else outside of South Florida. This project attempts to restore some semblance of the upland plant associations that may have occurred here. This would be accomplished by planting forty two (42) separate upland hammocks throughout the project ROW. These hammocks would consists of trees, palms, shrubs, and assorted ground cover. Proposed species are provided in Appendix VI, Planting and Monitoring Plan. There would be twenty one (21) hammocks that would cover an area of approximately 950 square feet and twenty one 21 hammocks that would cover an area approximately 1,350 square feet each. The location of the upland hammocks was determined by the objectives of providing habitat, shade and improving the aesthetics of the area while maintaining an open visual zone for security purposes. The constraints that were critical in the hammock site selection included the limits of the ROW, need to retain portions of the canal in an unmodified condition for maintenance operations and maintenance equipment access. Another major constraint was that available space was further reduced because of the preference for restoring the ecologically more significant littoral ledge and riparian zone communities.

While these forty two (42) areas will provide only about one and a half acres of upland hammock habitat, they will be a haven for all types of birds , particularly song birds. Small mammals, reptiles and other fauna will also benefit from this diverse habitat. The considerable ecotone, or edge effect, that would be provided by these 42 discrete hammocks would be further beneficial to birds and wildlife when compared with a continuous area of the same size. The principal trees in these hammocks will be reminiscent of the native vegetation that occurred here, adjacent to the historic transverse glades. Every attempt will be made to plant species endemic to South Florida. The planting specifications will be determined during the Plans and Specifications phase of this

project. Also the Planting and Monitoring Plan, Appendix VI, will be revised as appropriate, prior to construction. Revised copies of Appendix VI will be provided upon request.

7.1.4 Water Quality

There may be short term degradation of water quality during construction of the preferred alternative due to suspended sediments. Turbidity screens will be used during construction to minimize sediment impacts. Since this is an excavation rather than a dredging project, turbidity impacts should be minimal. Over the long term the project will improve water quality by trapping suspended sediment in the riparian s and littoral zones. The vegetation in these zones should also remove nutrients and other contaminants. The riparian zone may help reduce water temperature through shading. The littoral vegetation should increase the dissolved oxygen level through carbon fixation. Water quality of discharges from Snake Creek Canal entering Biscayne Bay may be slightly improved by the project but the effects will probably be diluted total volume of water in the remainder of the canal. Since all other alternatives involve less excavation in the canal, they would have slightly less short term detrimental effect on water quality. However, these other alternatives would restore between one half and two thirds less of the highly significant littoral ecosystem with a correspondingly less benefits to water quality. See Tables 4 and 5 for more details.

7.1.5 Fish

The littoral ledge and wet portion of the riparian zone will provide spawning habitat for some species of fish. The diverse wetland and aquatic plant, which would occur on the littoral ledge and riparian zone, will provide a direct and indirect supply of food for many species of fish. This vegetation will also provide shelter for fish, which will result in a much larger biomass of all fish species that occur in Snake Creek Canal. Numerous sportfish prefer littoral zones including largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*) and readear sunfish (*L. microlophus*). The preferred alternative provides between two and three times as much of this important habitat than the other three competing alternatives. See Tables 4 and 5.

7.1.6 Reptiles and Amphibians

Species diversity and relative abundance of all species of reptiles and amphibians would increase significantly under all four of the final alternatives. The preferred alternative would provide the best range and quantity of habitats for species dependent on aquatic, transitional and upland habitats. Species such as the leopard frog, pig frog, two-toed amphiuma , greater siren, lizards and skinks should become very common in the diverse habitats created by this project.

7.1.7 Invertebrates

This category includes all animals that do not have vertebra ranging from microscopic protozoans to crustaceans such as blue crab and crawfish and mollusks such as the apple snail. There is little data about invertebrates that occur in Snake Creek Canal. Blue crab and crawfish have been documented to occur there and common invertebrates such as the water strider, mayfly and water beetle are bound to be there. The lack of information about invertebrates does not reflect their importance to the ecosystem. Invertebrates, along with plants, are the foundation of the food web. Detrital matter produced by the plants on the littoral ledge and those along the canal edge will greatly enhance the abundance and species diversity of invertebrates in Snake Creek Canal. These invertebrates, such as the apple snail (*Pomacea paludosa*), would be a food source for many species of fish and birds.

7.1.8 Mammals

The residential nature of the area would continue to strongly influence the mammals that occur along the ROW. Those species presented in the Environmental Setting section of the report will

remain. Raccoons and opossums may benefit from the increased food and habitat. Mink, marsh rabbit, eastern yellow bat, evening bat and freetail bat may also benefit from the new habitat. Manatee rarely enter Snake Creek Canal, but to the extent that this should happen, they will find an improved food supply along the littoral ledges.

7.1.9 Birds

Wading birds will be a major beneficiary of this project. The 450,000 square feet of new, high quality littoral ecosystem should contribute to the well-being of numerous wading birds annually. More detailed discussion of impacts on wading birds is presented under Indicator Species. Almost all 400 species of birds that occur in South Florida will benefit from the type of habitat that will be restored in the project area. The preferred alternative provides considerably more benefit for birds than do the other alternatives.

7.1.10 Threatened, Endangered and Species of Special Concern

The Federally listed wood stork and the State listed little blue heron, tri-colored heron, snowy egret and white ibis will significantly benefit from the habitat provided by the proposed ecosystem restoration project. Loss of scrub habitat is considered to be the single most important reason for the decline of the Florida scrub jay, a Federally listed species. The scrub vegetation in the upland hammocks and riparian zone should contribute to the recovery of the Florida scrub jay. The Federally listed snail kite would also benefit from the project particularly if the apple snail, its primary food source, becomes well established on the littoral shelves. The Federally listed Eastern indigo snake would also benefit by having more escape cover and an enhanced food supply provided by the riparian zone and upland hammocks. The cumulative impact of similar habitat being created at other canal ecosystem restoration projects should help in the recovery of these listed species.

7.1.11 Indicator Species

Birds are an excellent species for indicating the robustness of the South Florida ecosystem. About 400 species of birds occur in Florida. About 40 % are year round residents and the remainder are migratory. The best indicators of the South Florida environment are wading birds. Populations of wading birds in South Florida plummeted to about 10 percent of their original level after extensive development occurred there. Every part of the wading bird life cycle is dependent on an adequate and continuous food supply. Even the timing of nesting is determined by food supply. This project, which will provide aquatic food in the wetlands and wet riparian fringe, upland food in the overall riparian zone and upland hammocks and nesting opportunities in shrubs and trees, will benefit virtually all species of birds that occur in South Florida.

7.1.12 Biscayne Bay

The improved water quality in Snake Creek Canal will also benefit the Biscayne Bay ecosystem. While the relative impact may be rather small, it is still a benefit to that receiving water body. Over time, as other ecosystem restoration projects, such as C-8 and C-7 are constructed, the cumulative beneficial impacts to Biscayne Bay will increase.

7.2 Other Project Benefits

7.2.1 Nature Oriented Recreation

The ecosystem restoration project will significantly raise the level of the nature oriented recreational experience in the area. It will be unique because there would be a thriving spectrum of ecosystems, ranging from aquatic, wetland to upland, in the midst of an intensively and extensively, developed urban area. The recreation features would capitalize on this unique setting by providing a 21,00 feet, almost (4) miles, long nature trail, 46 benches at good locations for

bird watching and resting, and interpretive features to facilitate nature study. Recreational use **without the project** is estimated to be 143,413 Annual User Days. Recreational use **with the project** is estimated to be 378,560 Annual User Days. Because of the all of the amenities provided by the project, the Unit Day Value would increase from $3.96 to $5.93. The Annual Activity Value, which is a measure of the annual benefit derived from the project, is estimated to be $1,680,000 (rounded). These estimates are conservative and do not include visitation by tourists or visitors outside of Miami-Dade County area. More detailed information is presented in the Recreation Resource Appendix which is contained in Appendix VIII.

7.1.2 Aesthetics

The appearance of the canal will change from being uniform in width to being wider in places where the littoral ledges and riparian zones are constructed. Also the shore to be retained in its current configuration will be opposite the shore that will be widened, to the extent practicable. These features will soften the straight appearance of the canal giving it a more natural, meander like, appearance. The riparian vegetation along the shoreline and upland hammocks on the ROW should further convey the feeling of this more natural look. A significant increase in birds, particularly large wading birds, will contribute to the aesthetics of the area.

7.1.3 Socio-econmics

Converting an almost barren canal and adjoining ROW into a thriving ecosystem, greenway and outdoor recreation area, will contribute to the well being of the community around it. This ecosystem restoration project will provide considerable environmental education opportunities to local schools. Since the canal traverses an ethnically diverse and economically disadvantaged community, this project will be in full compliance with the spirit and intent of **Environmental Justice**. The littoral ledges will provide a degree of safety to persons who intentionally or unintentionally enter the canal.

7.1.4 Educational Opportunities

There are several schools close to the area of Snake Creek Canal that would restored. The ecosystem restoration project will provide a unique experience to teachers to learn first hand about the functioning of ecosystems. The **"living outdoor classroom"** is becoming popular concept in the region.

7.1.5 Air Quality

While there may be a slightly increase in the concentration of hydrocarbons and dust during construction, there will not be any significant degradation in air quality from this project over the long term.

7.2 Cumulative Impacts

The littoral zone ecosystem restoration, riparian zone and upland habitat restoration all will have a net ecological benefit to the Snake Creek Canal watershed. Similar proposed project in parts of Biscayne Canal (C-8) the Little River Canal (C-7) would contribute to an increased, beneficial cumulative impact to the environment. All of these projects will complement the massive Comprehensive Everglades Restoration Project (CERP) currently underway.

7.3 Cost Effectiveness and Benefits Summary

An intuitive, or reasoning form of **incremental analysis** was performed throughout the iterative planning process. During the early stages of the planning process there were two major concepts

of ecosystem construction alternatives; ponds/wetlands and littoral ledge. Because of the limitations of the ROW the ponds/wetlands would need to small or narrow. The need for

TABLE 7: BENEFITS TO LISTED SPECIES

SPECIES	LISTED	HABITAT	COMMENT
Wood Stork	E	Littoral Shelves and wet portion of Riparian Zone	The shallow littoral shelves and the wet portion of the riparian zone, will provide the best possible foraging habitat for these species. Detritus from the riparian zone will ensure that wading bird food is produced at an optimum level. There will be 46 discrete littoral ledges with a total area of about 10 acres coupled with an additional 5 acres of riparian zone vegetation. There may also be additional benefits derived from the 100 foot intervals of open water between the ledges.
Little Blue Heron	SC		
Tri-Colored Heron	SC		
Snowy Egret	SC		
White Ibis	SC		
Snail Kite	E		The snail kite would also benefit significantly from this project if its food source, the apple snail, is introduced into this new habitat.
Florida Scrub Jay	E	Upland Hammocks and Riparian Zone.	Decline of Florida scrub jay is attributed to extensive loss of shrubs through out its range. Ideal habitat for this listed species will be provided through out the project area.
Eastern Indigo Snake	T		Since this species is still being extensively collected for the pet market, the escape shelter provided by this project should contribute to its survival in its natural habitat. Project will also provide greater availability of food for this species.
West Indian Manatee	E	Littoral Shelves	West Indian manatee will benefit from the vegetation that will occur on the littoral ledges.
Osprey	SC	Open water and watermost part of Littoral Shelf	The lager and more abundant fish that would be produced by the littoral ledge ecosystem would provide a significant improvement in food supply for the osprey.

maintenance equipment access to the canal imposed even greater restrictions on the pond/wetland concept. Long, narrow ponds/wetlands would require almost twice as much excavation as would construction of a ledge along the banks of the canal to get the same area of habitat. The ponds/wetlands could be made wider if bridges or culverts were constructed to accommodate maintenance equipment, but this would increase cost without any benefit to the environment. These isolated ponds/wetlands would not provide very good habitat compared to that which would be created by the littoral shelves. Even if the ponds/wetlands were connected to the canal, the quality of the habitat, acre for acre, would still not be as ecologically desirable as that of the littoral shelves. Furthermore, the habitat created by the pond/wetland alternative would not be close to the very significant type that existed in the original, slow moving Snake Creek slough. The littoral shelves would more closely resemble the habitat that was lost.

For the littoral ledge and riparian zone alternatives, the incremental costs are proportionate with the benefits. (It should be noted that the riparian zone alternative would yield significantly less environmental benefits relative to the costs as a stand-alone project than one coupled with the littoral ledge. Conversely the littoral ledge productivity would be diminished without the riparian vegetation). If there were no constraints on the ecosystem restoration project, a detailed analysis of the littoral ledge alternative would probably yield a sharp increase in incremental cost at some point. However, due to the constraints of ROW, land requirements for maintenance equipment access and need to keep sections of the canal bank unmodified, such an incremental analysis was not necessary. Once the optimum design of the littoral ledge was established, it was combined with other project features and these were further analyzed as alternatives. The final plan formulation iterations refined the project to four alternatives and then continued to select the one that provided the best overall ecosystem returns for the expenditure of public funds. An analysis of costs and relative ecosystem benefits, Table 5, demonstrated that the preferred alternative provided the best overall environmental return for the cost. The Preferred Alternative provides the greatest ecosystem return for the expenditure of funds.

8 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

A more detailed presentation on environmental compliance is contained in Appendix X.

TABLE 8: RELATIONSHIP OF PROPOSED ACTION TO ENVIRONMENTAL REQUIREMENTS.

Federal Laws and Policies	**Proposed Action**
Abandoned Shipwreck Act of 1987	N/A
Clean Water Act of 1977, as amended	Full Compliance
Clean Air Act, as amended	Full Compliance
Coastal Zone Management Act of 1972, as amended	N/A
Coastal Barrier Resources Act of 1982	N/A
Endangered Species Act of 1973, as amended	Full Compliance (Appendix XI)
Estuary Protection Act of 1968	N/A
Federal Water Project Recreation Act of 1968, as amended	N/A
Fish and Wildlife Coordination Act of 1934, as amended	Full Compliance (Appendix III)
Fishery Conservation and Management Act of 1976	Full Compliance
Hazardous and Toxic Materials Issues	Full Compliance
Land and Water Conservation Act of 1964, as amended	Full Compliance
Marine Protection, Research, and Sanctuaries Act of 1972, as amended	N/A
Marine Mammal Protection Act of 1972, as amended	N/A
Migratory Bird Treaty Act of 1918, as amended	Full Compliance
National Historic Preservation Act of 1966, as amended	Full Compliance
National Environmental Policy Act of 1969, as amended	Full Compliance
River and Harbor Act of 1970, Public Law 91-611, Section 122	Full Compliance
Submerged Lands Act of 1953, as amended	N/A
Water Resources Development Act of 1986, Section 906	Full Compliance
Watershed Protection and Flood Prevention Act of 1954, as amended	Full Compliance
Wild and Scenic Rivers Act of 1968, as amended	Not Applicable
Executive Orders (EO), Memoranda, etc.	
EO 11988, Flood Plain Management	Full Compliance
EO 11990, Protection of Wetlands	Full Compliance

EO 11593, Protection and Enhancement of the Cultural Environment Full Compliance
EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations Full Compliance
CEQ Guidance on Prime and Unique Farmlands Full compliance

State Law and Local Policies

Florida Coastal Zone Management Program Full Compliance (Appendix V)
Florida WQ Certificate Full Compliance
Florida Statewide Comprehensive Outdoor Recreational Plan Full Compliance

Note: Full compliance is defined as having met all the requirements of the statute, Executive Order, or other environmental requirement for the current stage of project planning.

9 PLAN IMPLEMENTATION

9.1 Relocations

There are no utility crossings, or other features, that will need to be relocated before the project can proceed.

9.2 Plan Flexibility

Should areas be encountered where it is extremely difficult, or considerably more costly, to excavate material during ledge construction, adjustments to the plan will be made, after appropriate coordination has taken place within the Corps.

9.3 Real Estate

All features of the project will be contained on project lands. There will be no expenditure of funds for real estate purposes by the Corps for any portion of this proposed ecosystem restoration project. There will not be any relocations associated with this project.

9.4 Construction Costs

Total project costs are within the $5 million Federal limit for section 1135 projects. Costs by construction feature are shown in Table 9 and by item and responsibility in Table 10.

In accordance with Policy Guidance Letter 59, Recreational Development at Ecosystem Restoration Projects, dated 11 June 98, the proposed recreational component may not increase the Federal cost of the Ecosystem Restoration project by more than 10%. The proposed ecosystem restoration project is in full compliance with this guidance.

9.5 Operation, Maintenance, Repair, Rehabilitation & Replacement (OMRR&R)

The estimated maintenance for a 1-mile greenway is approximately $6,500 dollars a year (Greenways, Inc, 2001). This includes the removal of trash from trailheads, weed control and mowing, minor repairs to furniture/safety features, and the cost of labor and fuel. This trail is approximately 4 miles considering

the four segments. This would roughly equal $26,000 a year for normal upkeep. This figure increases with the addition of resurfacing, required every 7-15 years. It would cost approximately $206,000 to resurface the entire trail corridor or $103,000 to overlay and topcoat the corridor. Sealcoating could be substantially less expensive. These costs can be offset by the use of volunteer labor combined with private sponsorship.

The replacement of site furnishings is dependent on the materials used. Metal and plastic furnishings last approximately 10-15 years along a trail with normal usage, while wood lasts approximately 7 years. Signage should be updated every 3 to 5 years due to fading as well as updated as new information becomes available.

TABLE 9: CONSTRUCTION COSTS OF PROJECT FEATURES

CONSTRUCTION FEATURE	COST•
Excavation, Disposal, Hydroseeding and Turbidity Barrier	$708,600
Littoral Shelves, Riparian Zone, and Upland Hammock Planting, Watering and Monitoring	$606,300
SUBTOTAL	**$1,314,900**
Recreation Cost Shared	$294,210
Recreation Locally Preferred Plan	$233,490
TOTAL	**$1,842,600**

• Cost estimate reflects May 2002 dollars.

TABLE 10: COST SHARING OF THE RECOMMENDED PLAN

ITEM	TOTAL	FEDERAL	NON-FEDERAL
Construction (P&S @ 10% and S&A @ 8% not included)	$1,314,900 (Recreation plan not included)	$986,175	$328,725
Non-construction Costs (P&S @ 10% and S&A @ 8%)	$331,500	$248,625	$82,875
Real Estate	$25,000	$18,750	$6,250
Study Cost	$290,000	$217,500	$72,500
SUBTOTAL:	$1,961,400	$1,471,050	$490,350
Recreation			
Cost Shared (50/50)	$294,210	$147,105	$147,105
Locally Preferred (100%)	$233,490		$233,490
TOTAL•:	**$2,489,000**	**$1,618,155**	**$870,945**

•Cost estimates reflect May 2002 dollars.

TABLE 11: REPAIR, REHABILITATION & REPLACEMENT (RR&R)

ITEM	SCHEDULE	COSTS
Benches	10 years	$5,400
Trail Interpretive Signage	3 – 5 years	$10,000-15,000
Asphalt Resurfacing	7 – 12 years	$206,000
Bridge Replacement	25 – 50 years	$100,000 + inflation

The operation, maintenance, repair, rehabilitation and replacement costs of this trail are the responsibility of the local sponsor. The table below represents the schedule and associated costs.

The OMRR&R costs are based on the salary schedule information available for the area. The OMRR&R costs are within feasible limits of the region. The total annual OMRR&R costs for all segments of the proposed C-9 Section 1135 Environmental Restoration Project could be slightly higher the first three years due to monitoring for invasive exotic plants in the littoral shelves. The South Florida Water Management District (SFWMD) stated herbicide costs could be as high as $2,000 per year. Mowing costs could also increase (October 12, 2001 letter from SFWMD). All estimated costs are subject to change.

10 DIVISION OF RESPONSIBILITIES

10.1 Federal Responsibilities

The Corps will be responsible for: pre-construction engineering and design, obtaining the water quality certification and advertising, awarding a contract and constructing this ecosystem restoration project. The Corps will also be responsible for 75% of the ecosystem restoration projects, with the exception or the outdoor recreation feature, which would be cost shared at 50%

10.2 Non-Federal Responsibilities

10.2.1 Non-Federal Costs and In-Kind Services

With the exception of initial monitoring for a maximum of three years, which would be cost shared at the same ratio as the basic project, the non-Federal partner is responsible for all operation and maintenance costs. Non-Federal Costs and In-kind Services

The non-Federal contribution is 25% for the ecosystem restoration project and 50% for the cost shared part of the recreational component. The remainder of the recreational component, consisting of a pedestrian bridge and benches, is considered to be a **Locally Preferred Plan** and is funded 100% Non-Federal cost. The non-Federal partner currently does not plan to provide in-kind services as part of their 25% contribution to this project.

10.2.2 Monitoring

Any monitoring that is required, beyond the initial year following project construction, will be the responsibility of the non-Federal partner.

10.2.3 Other Responsibilities

None at this time.

11 RECOMMENDATIONS

I have weighed the benefits to be realized from the proposed ecosystem restoration and ancillary recreational facilities along C-9 (Snake Creek Canal), Dade County, Florida, against project costs and considered the alternatives, impacts, and scope of the proposed project. In my judgment, the proposed project is a justified expenditure of Federal funds with such modifications thereof as in the discretion of the Commander, HQUSACE, may be advisable. I recommend that the Secretary of the Army approve the C-9 (Snake Creek Canal) Environmental Restoration Report. The total estimated cost of the project is

$2,**489,100** of which **$527,700** would be for a recreational component consisting of bike trails benches and interpretive signs. The Federal cost share would be **$1,618,155**. The remaining **$870,945** would be provided by the non-Federal sponsor, the South Florida Water Management District. Corps policy limits the recreational component of an ecosystem restoration project to 10% of the Federal cost. Since the recreational component for this project exceeds 10% of the Federal cost, the sponsor will fund the difference of $233,490 as a Locally Preferred Plan. I further recommend that funds be allocated mid-fiscal year 2002 to initiate preparation of plans and specifications.

The sharing of costs between the Federal Government and non-Federal interests for the recommended plan is based upon Section 1135 of the Water Resources Development Act of 1986, as amended. The non-Federal sponsor shall provide 25 percent of the total constructed costs for the restoration component, and 50 percent of the total cost shared recreational component and 100 percent of the Locally Preferred Plan recreational component. The above recommendations are made with the provision that prior to project implementation, the non-Federal sponsor shall enter into a binding agreement with the Secretary of the Army or his designated representative to perform the following items highlighted in the Project Cooperation Agreement (PCA), a draft of which is enclosed in the Appendices:

a. Provide all land, easements, and right-of-way, and suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the implementation, operation, and maintenance of the Project Modification;

b. Provide all improvements required on lands, easements, and right-of-way to enable the proper disposal of dredged or excavated material associated with the implementation, operation and maintenance of the Project Modification. Such improvements may include, but are not limited to, retaining dikes, water weirs, bulkheads, embankments, monitoring features, stilling basins, and de-watering pumps and pipes;

c. Provide, during implementation, any additional amounts as are necessary to make its total contribution equal to 25 percent of project modification costs for restoration and 50 to 100 percent for recreation;

d. For so long as the Project Modification remains authorized, operate, maintain, repair, replace, and rehabilitate the completed Project Modification, or functional portion of the Project Modification, at no cost to the Federal Government, in a manner compatible with the Project Modification's authorized purposes and in accordance with applicable Federal and State Laws and regulations and any specific directions prescribed by the Federal Government;

e. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor, now or hereafter, owns or controls for access to the Project Modification for the purpose of inspection, and, if necessary after failure to perform by the non-Federal sponsor for the purpose of completing, operating, maintaining, replacing, or rehabilitating the Project Modification. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall operate to relieve the non-Federal sponsor of responsibility to meet the non-Federal sponsor's obligations, or to preclude the Federal Government from pursing any other remedy at law or equity to ensure faithful performance;

f. Hold and save the United States free from all damages arising from the implementation, operation, maintenance repair, replacement, and rehabilitation of the Project Modification and any Project Modification related betterment, except for damages due to the fault or negligence of the United States or its contractors;

g. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the Project Modification in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Sections 33.20;

h. Perform, or cause to be performed, any investigations for hazardous substances as are deemed necessary to identify the existence and extent of hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the implementation, operation, and maintenance of the Project Modification, except for any such lands, easements, or right-of-way that are owned by the United States and administered by the Federal Government, and except for any such lands that the Federal Government determines to be subject to the navigation servitude. The Government shall perform, or cause to be performed, all investigations on lands, easements, or right-of-way that are owned by the United States and administered by the Federal Government. For lands that the Federal Government determines to be subject to navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

i. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or right-of-way that the Federal Government determines to be required for the implementation, operation, or maintenance of the Project Modification, except for any such lands, easements, or right-of-way owned by the United States and administrated by the Federal Government;

j. As between the Federal Government and the non-Federal sponsor, the non-Federal sponsor shall be considered the operator of the Project Modification for the purpose of CERCLA liability. To the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the Project Modification in a manner that will not cause liability to arise under CERCLA;

k. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the implementation, operation, and maintenance of the Project Modification, including those necessary for relocation, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

l. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C.2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army" and shall include the application of, and compliance with, the Davis-Bacon Act, Contract Work Hours and Safety Standards Act and the Copeland Anti-Kickback Act for relocations and non-Federal work-in-kind ;

m. Provide 25 percent of that portion of total historic preservation mitigation and data recovery costs attributable to the Project Modification that are in excess of one percent of the total amount authorized to be appropriated for the Project Modification.

n. Under no circumstances shall the total Federal cost of the environmental restoration, including previous study costs, exceed the legislated maximum per modification total cost of $5,000,000.

o. Not more than 80 percent of the non-Federal sponsor share of the total project cost may be credit for work-in-kind.

"The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding."

James G. May
Colonel, Corps of Engineers
Commanding

12 CONTRIBUTORS, PREPARERS AND REVIEWERS

12.1 Contributors

12.1.1 Interdisciplinary Project Team

Bradley Foster, Ph.D., Ecologist, USACE
Paul C. Stevenson, ASLA, Environmental Protection Specialist; USACE
Annon I. Bozeman, Environmental Protection Specialist; USACE
Grady Caulk, Archeologist, USACE
Jim Riley, Environmental Engineer, USACE
Tony Dipero, Cost Engineer, USACE
Diane Oxendine, Realty Specialist, USACE
Tom Arnold, Economist, USACE
Brian K. Files, Hydraulic Engineer, USACE
Brooks Moore, Office of Council, USACE
Jose Fuentes, Government Affairs Specialist, S F WMD
Chuck Flink, ASLA, Landscape Architect, Greenways, Incorporated
Isabel Cosio Carballo, Regional Coordinator, South Florida Regional Planning Council
Mercedes Barreras, Regional O&M Director, Miami Field Office, SFWMD
Jody Haynes, Program Extension Agent, UF-IFAS, Miami-Dade County
Betty Grizzle, Supervisor Biologist, USFWS
Michael Abney, Biologist, USFWS
Jay Slack, Field Supervisor, USFWS
Michael Johnson, National Marine Fisheries Service
Jerry Dial, Biologist, Dial Cordy & Associates
Joseph Walsh, PhD., Florida Fish & Wildlife Conservation Commission

12.1.2 Other Contributors

Rudy Nyc, Biologist, Innovative Environmental Solutions, Inc.

12.2 Preparers

Paul C. Stevenson, ASLA, Environmental Protection Specialist; USACE
Annon I. Bozeman, Environmental Protection Specialist; USACE
Grady Caulk, Archeologist, USACE
Jim Riley, Environmental Engineer, USACE
Tony Dipero, Cost Engineer, USACE
Dr. Bradley Foster, PhD., Civil Engineer, USACE
Diane Oxendine, Realty Specialist, USACE
Tom Arnold, Economist, USACE
Brian K. Files, Hydraulic Engineer, USACE
Rudy Nyc, Biologist, Innovative Environmental Solutions, Inc.

12.3 Reviewers

12.3.1 Independent Technical Review

Independent Technical Review (ITR)of the Preliminary Draft Integrated Environmental Restoration Report and Environmental Assessment, February 2002, was conducted by the following:

Jimmy Matthews EN-T
Haskell Wright EN-T
Rafael Velez EN-T
Jerrell Pennington EN-C
Karl Nixon RE-S
James Baker PD-R
Annon Bozeman PD-EG
Dan Peck PD-D
Paul Stevenson PD-ES
Joseph Tavares CO-CQ
John Pax OC
Brooks Moore OC

12.3.2 Responses to Independent Technical Review Comments

The following provided written responses to the formal comments prepared by the ITR reviewers.

Paul Stevenson PD-E
Rudy Nyc PD-P Contractor
Anthony Dipiero EN-C
Diane Oxendine RE-A
Robert Henderson EN-DL

13 COORDINATION WITH OTHERS AND REPORT RECIPIENTS

13.1 Coordination

Multi-agency meetings were held on September 28, 1999 and October 18, 1999 to introduce the interdisciplinary team members and undertake a site visit to the proposed project lands. Correspondence with Congresswoman Meeks office occurred on January 27, 2000 and January 9, 2001. Public meetings

were held in the project area on July 14, 2001 and August 24, 2001 to present conceptual plans and provide a platform for comments.

Interdisciplinary project team members have kept in touch via email, phone calls and faxes on a regular basis. Review comments have been received from US Fish and Wildlife Service, National Marine Fisheries Service and the Florida Game and Fish Conservation Commission. Public meeting survey feedback and pertinent correspondence can be viewed in Appendix V.

13.2 US Fish and Wildlife Service Recommendations and Corps Responses

The Fish and Wildlife Coordination Act Report is in Appendix III.

1.**Recommendation** Prior to construction, sediments in areas to be excavated should be sampled (using standardized protocols) and analyzed for concentrations and bioavailability of potential toxins, such as metals and pesticide residues.

Response The canal will not be dredged. Upland material will be excavated from the sides of the canal. We see no reason to test this upland material.

2. **Recommendation** During construction, Best Management Erosion and Sedimentation Control Practices should be utilized to minimize turbidity downstream. This should include utilization of silt screens, floating booms, etc. Construction should be minimized during rain events and vegetative cover on exposed canal banks should be established as soon as is practicable.

Response Silt screens will be utilized.

3. **Recommendation** Sediments removed from the canal banks should be disposed off-site at appropriate locations and not within the canal flood plain. The Service recommends that the project planning process provide for an estimate of the quantity of disposed material in order to plan for necessary disposal locations.

Response Some of the material will be placed on the littoral shelves to provide substrate for the vegetation. We anticipate that much of the limestone will be hauled off by the contractor and used in construction projects**.**

4 **Recommendation** Littoral shelves created on the canal banks should be configured to provide a slight slope instead of a flat slope to reduce deposition of material and filling of planted areas. Additionally, the Service recommends that, within that portion of the C-9 canal adjacent to the Pro Player Stadium, littoral shelves be constructed on the opposite side of the canals from the proposed recreational trails. This should result in less disruption to wildlife utilizing these areas during times when activities are occurring at the stadium.

Response The recommended plan will slope from two feet to the water surface. Your suggestion for the area near Pro Player Stadium will be incorporated into the project design.

5. **Recommendation** Long term maintenance of the canals is the responsibility of the SFWMD. The Service recommends that the SFWMD coordinate with local groups/agencies such as the Adopt a Canal program to assist with maintenance responsibilities. —

Response We will pass this suggestion on to the SFWMD.

6. **Recommendation** The project design, construction, and monitoring should be closely coordinated with representatives from Miami-Dade Department of Environmental Resources Management (DERM)

and Florida Department of Environmental Protection as these agencies have been working together on canal management issues. For example, the location of existing discharge culverts and the potential requirement for rip-rap within these areas will need to be evaluated relative to proposed littoral zones. The Service recommends that *Juncus* sp. or *Scirpus* sp. be used for planting in the upper tidal zone rather than the common reed (*Phragmites* sp.). Monitoring should be conducted on a quarterly basis in order to evaluate plant survival and need for control of exotic/nuisance plants.

Response Coordination will continue with DERM and FDEP throughout construction and monitoring. Details regarding plants and monitoring are contained in Appendix VI.

7. **Recommendation** Additionally, the operation schedule for the two canals should be reviewed in order to evaluate as to whether these operations are consistent with project objectives and to minimize excessive flooding and scouring of planted littoral zones.

Response The restoration project can not modify the operation of the canal if it interferes with the authorized purposes of flood protection and salt water intrusion control. However, the way the canals are operated is conducive for good growth of wetland plants on the littoral shelves.

8. **Recommendation** The development of interpretive signs and trail development should be closely coordinated with county park outreach staff and involve local schools in the process.

Response Good suggestion.

9. **Recommendation** The Service also recommends that this project be coordinated with the Florida Fish and Wildlife Conservation Commission for technical assistance related to establishing fish attractors and/or fisherman access points as part of the proposed project.

Response Coordination is a good idea but there may be little that could be done in the canal because of stringent maintenance requirements by SFWMD.

10. **Recommendation** The Service recommends that recreational trails be constructed of mulch or other pervious material instead of concrete. Mulch provides a substrate that is absorbent to rainfall and should contribute to the attenuation of stormwater runoff into the canal.

Response Please see discussion on this topic in Section 5 of the main report and in Appendix VIII.

11. **Recommendation** The Service agrees with informal comments received from the Florida Fish and Wildlife Conservation Commission that a heterogeneous littoral zone will be more ecologically advantageous than a homogeneous shelf. Therefore we recommend that the canal banks and newly created littoral zones be designed in order to create variation in shelf depths and widths with a diversity of flora so as to provide additional benefits to fishes and wading birds.

Response Variations in littoral shelf depth is part of the recommended plan.

Summary of FWS Position

The proposed improvements to littoral areas of existing flood control canals, with the inclusion of the above recommendations, should provide improvements to fish and wildlife habitat. The creation of functioning littoral wetlands should promote biological diversity and productivity within portions of the canal and secondarily provide improvements to water quality. Enhancements to adjacent upland areas of

the canals provide additional opportunities for recreational use, including walking, jogging, bicycling, fishing and bird watching, and provide added recreational value to the surrounding communities.

13.3 List Of Report Notification

The following were notified of the availability of the draft ERR/EA.

Representatives

Honorable Carlos Lacasa
Honorable Mario Diaz-Balart
Honorable Douglas Pile
Honorable J. Alex Villalobos
Honorable Kendrick Meek
Honorable Carrie Meek
Honorable Wilbert "T" Holloway
Honorable Fredrica S. Wilson

Federal Agencies

U.S. Department of Agriculture
U.S. Environmental Protection Agency, Office of Federal Activities
U.S. Environmental Protection Agency, Region IV
USEPA, South Florida Office, West Palm Beach, FL
U.S. Department of Interior, Office of the Secretary
U.S. Department of Commerce, Office of the Undersecretary
U.S. Department of Commerce, NEPA Coordinator
USGS Ecosystem Restoration
USGS Water Resources Division
USACE Policy Review Branch
National Oceanographic & Atmospheric Administration,
National Marine Fisheries Service
National Marine Fisheries Service, St. Petersburg, FL
U.S. Bureau of Mine Reclamation
Federal Highway Administration
U.S. Geological Survey
U.S. National Park Service
U.S. Fish and Wildlife Service
U.S. Department of HUD
Advisory Council of Historic Preservation
Federal Emergency Management Administration, Regional Director
U.S. Public health Service, Office of the Director
Everglades National Park

State Agencies

Florida Department of Environmental Protection, Tallahassee, FL
Florida Department of Environmental Protection, West Palm Beach, FL
South Florida Water Management District, West Palm Beach, FL
Florida Department of Agriculture
Florida Department of Transportation, Miami, FL
Florida Department of Community Affairs
Florida Fish & Wildlife Conservation Commission

House of Environmental Protection Committee, Tallahassee, FL
Executive Office of the Governor
Florida Department of State, Division of Historic Resources
Florida Department, Division of State Lands
South Florida Regional Planning Council
UF/Miami-Dade County Agricultural Extension Service
Governor's Commission for the Everglades
Office of Tourism & Economic Development
Oleta River State Park

Local Government
Miami-Dade City Board of County Commissioners
Miami-Dade City Planning Department
Miami-Dade County Department of Planning & Zoning
Miami-Dade Department of Environmental Resources Management
City of North Miami
City of North Miami Beach
Dade County Agricultural Council
Metro Dade City Parks & Recreation Department
Miami-Dade County Parks & Recreation
City of Fort Lauderdale
City of Lauderhill
Board of Commissioners, Opa Locka, FL
Mayor, Opa Locka, FL
City of Pembroke Pines
Hollywood Board of Commissioners
North Dade Community Council #2, #3, #4
North Dade County Citizen Association
Rainbow Park Community Council
Miami-Dade Legislative Delegation
Miramar Economic Development Advisor Board
Everglades Coordinating Council
Miami-Dade Metropolitan Planning Organization

Utilities
Miami-Dade Water & Sewer
North Dade Landfill

Independent Groups
Miccosukee Tribe of Indians
Seminole Tribe of Florida
The Nature Conservancy Center
Sierra Club/Broward Sierra Club/National Sierra Club
Audubon Society of the Everglades
National Audubon Society
Institute for Regional Conservation, Miami, FL
Audubon of Florida
Trust for Public Lands
Florida Wildlife Federation
World Wildlife Fund
National Parks & Conservation Association

Natural Resources Defense Council
The Everglades Coalition
Defenders of Wildlife
National Resources Defense Council
Environmental Defense Fund
Biodiversity Legal Fund
1000 Friends of Florida
Florida Biodiversity Project
The Trust for Public Lands
Friends of the Everglades
Pro Player Stadium

Newspapers
Miami Herald
Miami News Times

Libraries & Universities
Miami-Dade Public Library System
North Dade Regional Library
University of Miami
Florida International University
Florida Atlantic University
St. Thomas University

HML Senior High School

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Personal Communication, Mr. George Gann, Executive Director, Institute for Regional Conservation, January 2002.

Personal Communication, Mr. Greg Ballinger, Florida Native Society, Dade County Chapter, January 2002.

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APPENDIX I

ENGINEERING

CANAL 9 (SNAKE CREEK) - SECTION 1135
ENVIRONMENTAL RESTORATION
Dade County, FLORIDA

Table of Contents

A. INTRODUCTION

1. General. Canal 9 (Snake Creek) is located in Dade and Broward County, Florida and was constructed as a part of the Central and Southern Florida Flood Control Project. This Appendix presents a discussion of applicable design considerations and construction methods utilized to establish a basis for the project cost estimates. The proposed restoration would apply to the reach of canal located in Dade County between the Florida Turnpike and NW 37th. Avenue.

2. Restoration Plan. The proposed restoration plan would consist of removing the exotic vegetation; degrading portions of the canal banks to create a gently sloping littoral shelf; and then planting these areas with a variety of marsh grasses. Details of the proposed plan and the benefits that would be derived are provided in the main report and the Environmental Assessment.

B. HYDROLOGY AND HYDRAULICS

3. General. The existing drainage capacity of the canal would be maintained because and the proposed degrading of the banks should not effect the canal hydraulic characteristics.

C. GEOTECHNICAL INVESTIGATIONS

4. General. Core boring were taken along the banks of the canal in support of preparation of the Partial Definite Project Report dated March 25, 1954 that was the basis for construction of the existing canal.

5. Materials. The bank material consists of a fine grained sand and organic matter with some pieces of limestone or sandstone and should be readily excavated.

D. CONSTRUCTION

6. General. The proposed restoration plan would involve general clearing of the canal banks, construction of successive littoral areas, and the planting of marine and other native vegetation. It is anticipated that the vegetation cleared from the upland areas would be placed within the canal right of way. All elevations are in feet and tenths and are referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29).

7. Excavation and Planting. The excavation of the canal banks to create the proposed wetland habitat and the planting requirements would be accomplished in accordance with the environmental restoration plan described in the main report and Environmental Assessment.

8. Disposal Area. The existing maintenance berm along both sides of the canal would be used for placement of the excavated material within the existing canal right of way. Any unsuitable material or debris would be transported to a local landfill.

9. Construction Procedure. The first order of work would consist of clearing the canal banks followed by excavation, grading, and planting. The work should progress uniformly along the canal to provide completed sections. This will minimize erosion and allow for concurrent construction of the recreational features.

E. RELOCATIONS

10. General. The project sponsor would be responsible for providing all the lands easements, rights-of-way, relocations, and disposal (LERRD) as required for construction of the proposed project features. One condition for implementation of the project was to maintain construction within the limits of real estate currently owned by the project sponsor.

When detailed surveys and real estate maps are developed for preparation of construction plans and specifications, the design cross-sections would be adjusted as necessary to satisfy this condition.

11. Utilities. The locations of the proposed littoral areas would be adjusted and modified as required to eliminate major impacts on existing utilities. However, detailed information on existing utilities needs be provided prior to preparation of construction plans and specifications to ensure that there are no Impacts.

F. OPERATION AND MAINTENANCE

12. General. The contractor would be responsible for all maintenance during the construction contract. After completion of the construction contract, the project
sponsor would assume the responsibility for operating and maintaining the project.
A discussion of the maintenance and monitoring requirements is presented in the Environmental Assessment and the main report.

G. QUANTITIES AND COST ESTIMATE

13. Summary of Costs. The estimates of first cost for construction of the recommended plan were prepared using M-CACES software and are presented in Table A-1. The estimate includes a narrative and summary cost showing quantity, unit cost, and the amount for contingencies for each cost item.

The costs have been prepared for an effective date of November 2001.

APPENDIX II

ECONOMIC EVALUATION

The best plan in an environmental restoration project study is the plan that meets the same general optimization criterion as in a traditional water resources development project whose primary or sole purpose is not environmental restoration. That criterion is maximization of net benefits. The alternative that maximizes net benefits is the alternative for which the difference between monetary and non-monetary costs and benefits is greater than for any other alternative. Benefits and costs for an alternative are the estimated differences between relevant conditions with and without the alternative.

For this restoration project, all benefits are non-monetary environmental improvement benefits that contribute to the national ecosystem restoration goals. Costs are the monetary costs of implementation and OMRR&R. The recommended plan was carefully designed and formulated by an interdisciplinary team of professional planners, engineers, and scientists. It is a relatively straightforward, simple plan to restore and create wetland and upland habitats along C-9, thereby re-establishing habitat that was lost when Canal 9 was constructed.

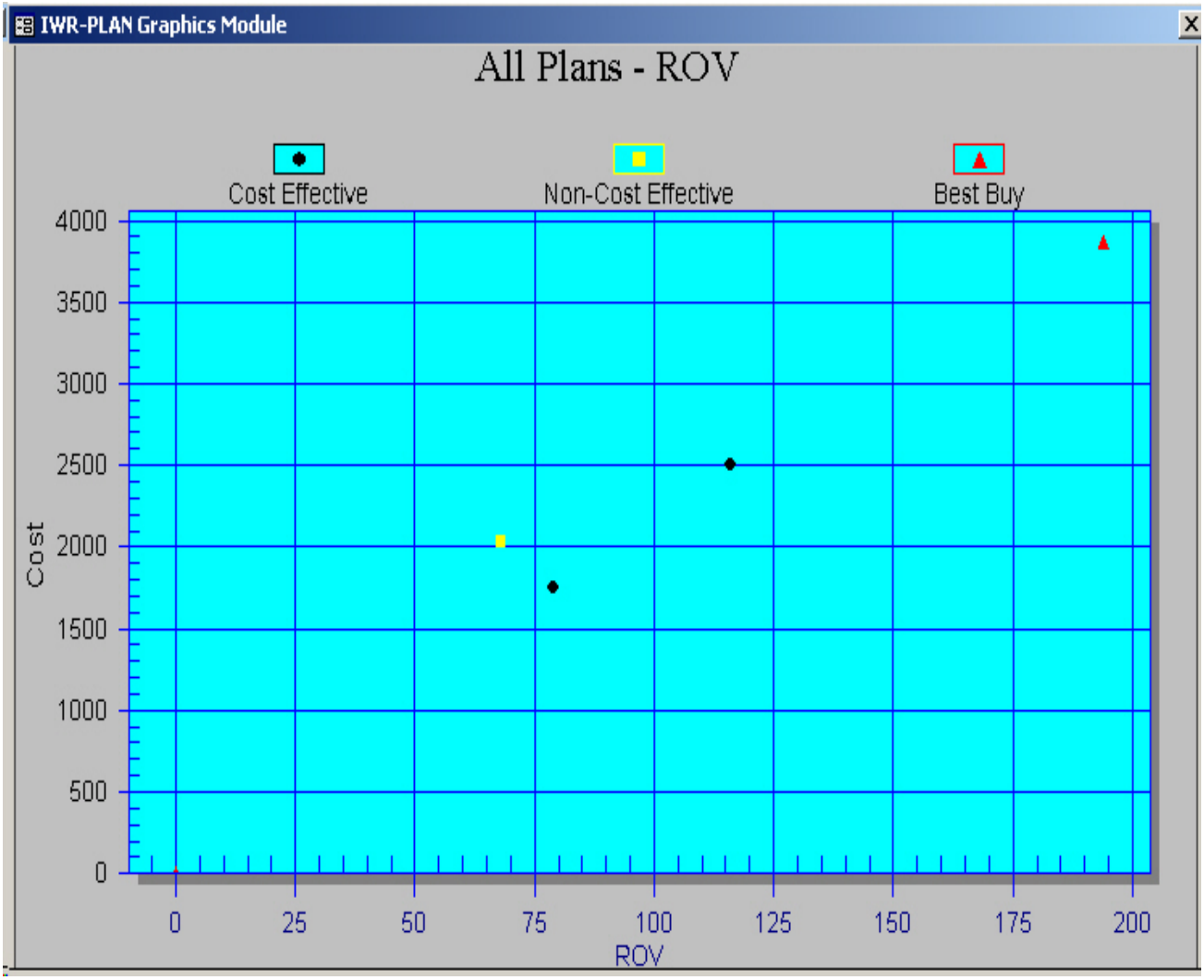
Cost effectiveness analysis is a method for comparing alternative plans that produce environmental outputs and for determining which plan can produce the largest quantity of output for a given cost, or produce the same or greater quantity of output for less cost. Cost effectiveness analysis determines if: (1) the same environmental output level could be produced by another plan at less cost; (2) a larger environmental output level could be produced at the same cost; or (3) a larger environmental output level could be produced at less cost. For instance, if two alternatives produce the same amount of environmental outputs, the alternative with the lowest cost is considered cost effective. Likewise, if the costs of two alternatives are equal, but one produces more outputs than the other, the one producing the higher level of outputs would be the cost effective alternative. Also, an alternative that costs less and produces higher levels of output is considered to be cost effective compared to higher cost alternatives producing lower levels of output.

The four plans evaluated are listed below. Simply scanning down the output column in Table 1, it can be seen that Alternative 6A should be dropped from further analysis since it is not cost effective. Chart 1 depicts a graphical representation.

Table 1. Cost and Habitat Unit Value Output of Alternatives

ALT *1/*	**Cost**	**Littoral Shelf**	**Riparian**	**Hammock**	**Ground Cover**	**Total Output**	**Cost/Output**
No Action	$0	0	0	0	0	0	N/A
5	$3,870,000	103	37	8	45	194	$19,948
5A	$1,750,000	33	12	8	18	79	$22,152
6	$2,500,000	57	25	8	26	116	$21,551
6A	$2,030,000	28	12	8	20	68	$29,852

Chart 1. Graphical representation of cost effective analysis.


IWR-PLAN Graphics Module
All Plans - ROV
Cost Effective
Non-Cost Effective
Best Buy
Cost
4000
3500
3000
2500
2000
1500
1000
500
0
0
25
50
75
100
125
150
175
200
ROV

The alternatives have been limited but now a selection must be made from among the remaining, cost effective, plans. Because these plans produce different levels of output, choosing from among them is making an output level selection. Choosing an output level is choosing the scale of the project. While total cost information is useful for screening out non-cost effective plans, in most cases, it should not be the sole criteria used for output level selection. While utilizing average and marginal costs is helpful, minimizing average costs alone would overlook the important question of "*is this level of output worth it?"* If the answer is "*Yes"*, perhaps then plans with higher average costs that produce more output are also "worth it". In theory, the selected plan should be where net monetary and non-monetary benefits are maximized and this occurs where monetary and non-monetary marginal revenues are equal to the marginal costs of the project. This intersection could occur above or below the average cost curve.

Since non-monetary revenues cannot be directly compared to costs, the evaluation requires two steps. First, the cost structure of the alternatives is analyzed. Three of the four plans evaluated are shown to be cost effective. Only alternative 5 is shown to be a "best buy". "Best buys" are the most efficient plans at producing the output variable. They provide the greatest marginal increase in the value of the output parameter variable for the least marginal increase in the value of the cost parameter variable. Marginal costs are shown in the following table.

Table 2. Average Costs, Incremental Costs, and Costs per Acre

ALT *1/*	**Cost**	**Total Output**	**Average Cost/Output**	**Incremental Cost**	**Acreage**	**Cost / Acre**
No Action	$0	0	N/A	N/A	N/A	N/A
5	$3,870,000	194	$19,948	$17,564	39.3	$98,473
5A	$1,750,000	79	$22,152	$22,152	15.4	$113,636
6	$2,500,000	116	$21,551	$20,270	23.5	$106,382

The second step requires a subjective evaluation of non-monetary marginal revenues. The preceding table indicates that alternative 5 has the lowest marginal cost of the group and is considered a "best buy". The non-monetary value generated by the other alternatives is not important in this evaluation since the optimum types of habitat have been formulated into alternative 5. However, the question remains, "Is the cost of the improvement worth at least $98,473 per acre?" The ecological significance of the habitat that would be restored is presenter in "Integrated Environmental Restoration Report and Environmental Assessment", February 2002. Endangered species and wading birds would be the primary environmental beneficiaries. The local community and the region would also benefit significantly from the overall project.

Economic Evaluation of Costs

Engineering Regulation 1105-2-100 (The Planning Guidance Notebook) provides economic evaluation procedures to be used in all Federal water resources planning studies. The guidelines specified in the ER 1105-2-100 dated 22 April 2000 were observed in preparing this report. The Federally mandated project evaluation interest rate of 6.125 percent, an economic period of analysis of 50 years and 2001 prices were used to evaluate economic feasibility. The life cycle costing of the evaluated alternatives are shown below:

Table 3. Total investment cost and total annual equivalent costs

Summary of Costs	Alternative 5	Alternative 5A	Alternative 6	Alternative 6A
Initial Construction	$3,870,000	$1,750,000	$2,500,000	$2,030,000
Interest during Construction	$TBC	$TBC	$TBC	$TBC
Total Investment	$TBC	$TBC	$TBC	$TBC
Annual Cost				
Interest and Amortization	$TBC	$TBC	$TBC	$TBC
O&M Costs	$TBC	$TBC	$TBC	$TBC
Total Annual cost	$TBC	$TBC	$TBC	$TBC

Assumptions
Construction cost evenly distributed over 12 months

APPENDIX III

FINAL
Fish and Wildlife Coordination Act Report

Biscayne Canal (C-8) and Snake Creek Canal (C-9)
Environmental Restoration Projects

December 12, 2001

Prepared by:
Dial Cordy and Associates Inc.
490 Osceola Avenue
Jacksonville Beach, FL 32250

Prepared for:
Jacksonville District
U.S. Army Corps of Engineers
400 West Bay Street
Jacksonville, FL 32207

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EXECUTIVE SUMMARY

The Central and Southern Florida (C&SF) Project, first authorized by Congress in 1948, has produced unintended effects to the south Florida ecosystem. Much of this can be attributed to a diminished capacity to retain large volumes of water that historically exhibited a delayed flow-through pattern and supported a mosaic of wetland landscapes. Intermediate trophic level aquatic species, which occupy critical links in the food web of the greater Everglades, have been greatly reduced due to loss of habitat and adverse hydrological changes.

The objectives of the C-8 and C-9 canal restoration projects are to provide for ecological enhancement of littoral areas within existing flood control canals and create additional recreational opportunities adjacent to the canal structures. This project should promote an – increase in the biological diversity and productivity of the canals, which should in turn enhance the fish populations and provide additional ecological and recreational values. The project also includes the construction of recreational trails adjacent to existing canals. Construction and successful operation of this project has the potential to improve fish and wildlife habitat within sections of the C-8 and C-9 canal systems. These improvements are consistent with U.S. Fish and Wildlife Service's goals and objectives for habitat enhancement projects in South Florida.

I. IDENTIFICATION OF PURPOSE, SCOPE, AND AUTHORITY

A. Introduction

The project involves two canals (C-8 and C-9) constructed by the U.S. Army Corps of Engineers (Corps) as part of the Central and Southern Florida (C&SF) Project for the purposes of providing flood control, water supply, prevention of salt water intrusion, and conservation of fish and wildlife resources. The construction and operation of the C&SF Project has produced major unintended impacts to the south Florida ecosystem including the loss in spatial extent of functioning wetland communities. The creation of artificial drainage systems has resulted in undesirable water quality and quantity effects to receiving water bodies. The primary purpose of the C-8 and C-9 canals is to provide flood control for the C-8 and C-9 basins, which have drainage areas of 30 square miles and 98 square miles, respectively. Restoration and enhancement projects within existing canal drainages offer opportunities to improve fish and wildlife habitat while still providing for the other purposes of the original C&SF Project.

B. Purpose and Scope of the Project

The primary objective of the C-8 and C-9 canal restoration projects is to enhance fish and wildlife habitats within water conveyance systems by providing additional ecological structure to identified segments of the canals. The creation of functioning littoral wetlands should promote biological diversity and species abundance within portions of the canal and, secondarily, provide improvements to water quality. Improved opportunities for passive recreational use, such as shoreline fishing, walking, bird watching, represent an additional component of the proposed project and provides added recreational value to the surrounding communities. -

C. Authority

The Energy and Water Development Act of 1995 provided authorization to begin design and construction of improvements to the C-7, C-8, and C-9 canals. This Coordination Act Report was prepared under the authority of Section 1135 of the Water Resources Development Act of 1986, as amended. The canals were authorized by the Flood Control Act of June 30, 1948, as part of the Central and Southern Florida Project for Flood Control.

II. AREA SETTING

A. Project Location

Project lands are located in northern Miami-Dade County in existing developed areas. Because the C-8 and C-9 Canal Restoration Projects occupy similar land use covers in Miami-Dade County, both proposed projects are treated as one project for the purposes of formulating this report. -

Biscayne Canal, C-8, is located in the cities of North Miami and Opa Locka, in Miami-Dade County, Florida. The canal extends westerly from Biscayne Bay for approximately 11 miles through a heavily populated residential area. The location of the canal and its relation to the overall project area is shown in Figure 1. The specific site of the canal considered for habitat restoration is an approximately 7,000-foot segment located between NW 27th Avenue and State Road 9 (Interstate 95).

Snake Creek Canal, C-9, is located in the cities of North Miami and Carol City, in Miami-Dade and Broward County, Florida. The canal extends westerly from the Oleta River for approximately 20 miles through a heavily populated residential area. The location of the canal and its relation to the overall project area is shown in Figure 2. The specific site of the canal considered for habitat restoration is an approximately 9,400-foot segment located between 37th Avenue and the Florida Turnpike in Miami-Dade County.

B. Description of Study Area

The study is located in a highly developed area of northeastern Miami-Dade County. Both canal project areas extend through primarily residential areas. Pro Player Stadium borders the Snake Creek Canal right-of-way on the eastern end of the project site on the south side of the canal.

The land use of the C-8 Basin consists of urban/built-up (70%), transportation and utility (15%) water (6%), agriculture (3.7%), upland forests (2%), barren land (1.9%), rangeland (0.6%) and wetlands (0.4%). The C-8 canal has a gated spillway just west of the Florida East Coast Railway, downstream from the proposed project area, that controls stages in the C-8 canal and regulates discharges to tidewater. A headwater stage is maintained to prevent saltwater intrusion to local groundwater.

The land use of the C-9 East Basin consists of urban/built-up (75%), transportation and utility (7.4%), agriculture (7%), water (5%) upland forests (2.8%), rangeland (0.8%), barren land (0.8%), and wetlands (0.7%). The C-9 canal has a gated spillway just east of U.S. Highway 1, downstream from the proposed project area, which controls stages and regulates discharges to tidewater. A headwater stage is maintained adequate to prevent intrusion of saltwater into local groundwater.

Current recreational use of these canals consists of shoreline fishing, bicycling, walking, jogging and bird watching.

C. Natural Resources

1. Soils

Soils throughout most of the project area are classified as urban land with some areas classified as udorthents-limestone substratum-urban land. Typically, the Udorthents consists of fill material that is light gray and white, extremely stony loam underlain by hard, porous limestone bedrock (USDA 1996). Existing soils along the canal banks are sandy and do not exhibit hydric characteristics.

2. Vegetative Communities

The project areas provide very little native vegetation due to the extensive development adjacent to both canals. The canal right-of-ways are maintained by the South Florida Water Management District (SFWMD). Vegetation in these areas is composed primarily of St. Augustine grass (*Stenotaphrum secundatum*), bahia grass (*Paspalum notatum)*, air potato vine (*Dioscorea bulbifera*), and other weedy species. Emergent and freshwater vegetation occurs in limited areas within the canal banks, examples of which include duck potato (*Sagittaria lancifolia*) and arrowhead (*Sagittaria latifolia*). - -

3. Avifauna

Avifaunal occurrences in the project area result primarily from occasional/seasonal use of canals by water birds (*i.e.*, waterfowl, wading birds). The canals also provide foraging habitat during low water periods for common water birds such as double-crested cormorant (*Phalacrocorax auritus*), anhinga (*Anhinga anhinga*), great blue heron (*Ardea herodias*), cattle egret (*Bubulcus ibis*), green heron (*Butorides striatus*), little blue heron (*Egretta caerulea*), black-crowned night heron (*Nycticorax nycticorax*), snowy egret (*E. thula*), great egret (*E. alba*), white ibis (*Plegadis chihi*), and glossy ibis (*P. falcinellus*). The vegetative structure present along the canal banks provides limited shelter and nesting habitat for common passerine birds such as northern cardinal (*Cardinalis cardinalis*), mockingbird (*Mimus polyglottos*), house sparrow (*Passer domesticus*), rufous-sided towhee (*Pipilo erythrophthalmus*), American robin (*Turdus migratorius*), red-winged blackbird (*Agelaius phoeniceus*), eastern meadowlark (*Sturnella magna*), common grackle (*Quiscalus quiscula*), boat-tailed grackle (*Q. major*), and brown-headed cowbird (*Molothrus ater*).

4. Mammals

The residential areas provide habitat for mammals that can adapt to human environments. The canal banks provide foraging opportunities for some mammals since the canals support prey species (*e.g.*, blue crab). Mammals likely to be found in the study area include the domestic dog (*Canis domesticus*), opossum (*Didelphis marsupialis*), house mouse (*Mus musculus*), cotton mouse (*Peromyscus gossypinus*), raccoon (*Procyon lotor*), black rat (*Rattus rattus*), hispid cotton rat (*Sigmodon hispidus*), nine-banded armadillo (*Dasypus novemcinctus*), and eastern mole (*Scalopus aquaticus*).

5. Fish

Drainage canals provide artificial aquatic habitats that are subject to regular anthropogenic disturbances such as drawdowns, flood events, and pollution, especially herbicide treatment. Native fish that occupy these types of habitat are supplemented and disrupted by introduced species that are better adapted to these drainage systems (Gilbert 1992). Examples of fishes likely to occur in the project area include killifish (*Cyprinodontidae*), live-bearers (*Poeciliidae*), sunfish (*Centrarchidae*), and catfish (*Ictaluridae*) families. - -

6. Reptiles and Amphibians

Reptiles common to the project location include striped mud turtle (*Kinosternon bauri*), eastern mud turtle (*K. subrubrum*), eastern mud snake (*Farancia abacura*), and cottonmouth (*Agkistrodon piscivorus*). Amphibians expected to occur within the canals and surrounding habitat include oak toad (*Bufo quercicus*), southern cricket frog (*Acris gryllus dorsalis*), tree frogs (*Hyla* spp.), little grass frog (*Pseudacris ocularis*), and narrowmouth toad (*Gastrophryne carolinensis*).

7. Federal Threatened and Endangered Species

The endangered wood stork (*Mycteria americana*) occurs throughout south Florida and is the only federally listed avian species likely to occasionally utilize the canals for foraging in this area. Upland areas adjacent to the canals may provide habitat for the eastern indigo snake (*Drymarchon corais couperi*) as this species is known to occupy urban environments as well as natural areas of Florida.

Manatees may occur within the project areas despite downstream-gated control structures. Two manatee deaths were recorded approximately two miles downstream of the project area. (Florida Fish and Wildlife Conservation Commission, 1974-Sept. 2000, Reported Manatee Deaths).

Potentially occurring National Marine Fisheries Service (NMFS) candidate species downstream from the project location include the mangrove rivulus (*Rivulus marmoratus*). This species is widely distributed but locally rare in Florida waters. Preferred habitat includes land crab burrows, stagnant pools, and old mosquito ditches in mangrove forests.

The nature of the habitats along the canals makes it highly unlikely any of the federally listed plant species would be present. None of the listed plant species were apparent during the site visits.

8. State-listed Species

The Florida Fish and Wildlife Conservation Commission (FWC) indicated that nine species, in addition to federally listed species, recognized as threatened, endangered, and/or of special concern, could potentially occupy the project location. These species are protected or otherwise given special consideration under Rules 39-27.003, 39-27.004, and 39-27.005 of the Florida Administrative Code. Table 1 provides a summary of these state-listed species.

Birds comprise the majority of state-listed species potentially associated with the project. Most of these are wading birds, which are generally dependent upon shallow open water for foraging on aquatic invertebrates and small fish. The American alligator is found throughout the study area in a variety of wetlands. -

Table 1 Species Listed by Florida Fish and Wildlife Conservation Commission as Threatened, Endangered, or of Special Concern, Excluding Federally Listed Species, Potentially Occuring within the Project Area (FWC 1997)

Common Name	Scientific Name	Designated Status
REPTILES		
Miami black-headed snake	*Tantilla oolitica*	Threatened
American alligator	*Alligator mississippiensis*	Special Concern
BIRDS		
Roseate spoonbill	*Ajaia ajaja*	Special Concern
Limpkin	*Aramus guarauna*	Special Concern
Little blue heron	*Egretta caerulea*	Special Concern
Tricolored heron	*Egretta tricolor*	Special Concern
Snowy egret	*Egretta thula*	Special Concern
White ibis	*Eudocimus albus*	Special Concern
Osprey	*Pandion haliaetus*	Special Concern

III. FISH AND WILDLIFE CONCERNS AND PLANNING OBJECTIVES

A. Resource Concerns

The construction and operation of the C&SF Project resulted in both direct effects (*e.g*., loss of spatial extent of natural areas and drainage of wetland habitats) and indirect consequences (*e.g*., land development) to the south Florida ecosystem. The steady urban growth in south Florida continues to contribute to and compound these problems (SFWMD 2000).

The physical characteristics of canals and their riparian zones are often primary factors limiting semi-aquatic and aquatic biological communities. By design, flood control canals inherently provide little opportunity for establishment of high-quality littoral communities since canal banks are generally steep sided to enhance conveyance capacity. Additionally, hydraulic transport and deposition of contaminated sediments represent important features of canal function that can be of concern to fish and wildlife resources that utilize these habitats. Watershed features, particularly land use and detention time, can influence water quality and sediment characteristics. As Class III waters, canal systems should be provided the same degree of protection as other surface waters to support aquatic life designations.

The C-8 canal and the western segment of C-9 canal are contained in the State of Florida's 1998 303(d) list of impaired water bodies. Parameters of concern for C-8 canal include dissolved oxygen, coliforms, and nutrients. The western portion of the C-9 canal is listed as impaired due to dissolved oxygen, nutrients, and mercury (based on fish consumption advisory). Rudolph (1985) found that north Miami-Dade canal systems studied in 1985 were impacted from nutrient and organic input as well as runoff from urban areas. More than a decade later, canal bioassessments detected the continued effects of those stressors, as well as the effects of canal maintenance activities (*e.g.*, mechanical harvesting and chemical treatment of vegetation) (Snyder *et al.* 1998).

B. Planning Objectives

The primary planning objectives for the C-8 and C-9 canal restoration projects are to provide ecological improvements to existing canal environments by enhancing littoral areas within the canals right-of-ways. A secondary objective is to enhance recreational use of adjacent upland areas. The proposed trails are designed to promote and enhance recreational uses within a region that has been identified by the Draft 2000 State of Florida's Statewide Comprehensive Outdoor Recreation Plan (SCORP) as lacking in adequate recreational resources (State of Florida 2000). -

IV. FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

Fish and wildlife habitat without the project will likely remain limited or deteriorate. The canals currently have very few areas of littoral zones and have low dissolved oxygen levels (EPA 2001). According to the State of Florida's Surface Water Quality Standards (Chapter 62-302), dissolved oxygen for these surface waters should never fall below 5mg/L. For the time period from 1991 to 1994, samples from the C-9 were below 5mg/L 98% of the time. Samples from the C-8 were below 5mg/L 66% of the time during the time period 1988 to 1994. Recreational use of the canals will likely remain comparable to current usage. Current recreational use of these canals consists of shoreline fishing, bicycling, walking, jogging and bird watching.

V. DESCRIPTION OF SELECTED PLAN

The primary feature of this project is the creation of littoral areas within identified sections of two flood control canals. Recreational enhancement of the canal's upland areas represents another important project component. The following description represents the proposed restoration plan, based upon the right-of-ways of the existing lands. Table 2 lists proposed plants to be planted in littoral zones of C8 and C9.

Table 2 Plant List for Littoral/Submerged Vegetation Zones for C-8 and C-9 Canals

Submerged Vegetation Zone		
Deep water (just below shelf): (24")		
	White pond lily	*Nymphaea odorata*
	Banana lily	*Nymphoides aquatica*
	Spatterdock	*Nuphar luteum*
	Eel grass	*Vallinsneria americana*
Shallow water: (18" - 12")		
	Widgeon-grass	*Ruppia maritima*
	Pondweed	*Potamogeton illinoensis*
	Red ludwigia	*Ludwigia repens*
	Lemon bacopa	*Bacopa caroliniana*
Intertidal Zone (12" - 6")		
	Arrow-arum	*Peltandra virginica*
	Duck potato	*Sagitaria lancifolia*
	Marsh mallow	*Sebatia grandiflora*
	Smooth water hyssop	*Bacopa monniera*
	Alligator flag	*Thalia geniculata*
	Pickerelweed	*Pontederia cordata*
	Spikerush	*Eleocharis cellulosa*
	Canna	*Canna flacida*
	Fleabane	*Pluchea rosea*
Upper Tidal Zone (6" - dry land)		
	Juncus	*Juncus effusus*
	Wild rice	*Zizaniopsis miliacea*
	False foxglove	*Agalinis linifolia*
	Flat sedge	*Cyperus odoratus*
	Hibiscus	*Hibiscus coccinea*
	Slender cordgrass	*Spartina bakerii*
	Shrub Zone (dry land)	
	Simpson stopper	*Myrcianthes fragrans*
	Necklace pid	*Sophora tomentosa*
	Jamaica caper	*Capparis cynophallophora*
	Coco plum	*Chrysobalanus icaco*
	Buttonwood	*Cephalanthus occidentalis*
	Spanish stopper	*Eugenia foetida*
	Myrsine	*Myrsine guianensis*
	Wild coffee	*Psychotria nervosa*

Trees (dry land)		
	Pond apple	*Annon glabra*
	Wax myrtle	*Myrica cerifera*
	Bald cypress	*Taxodium distichum*
	Satin leaf	*Chrysophyllum oliviforme*
	Dahoon holly	*Ilex cassine*
	Cabbage palm	*Sabal palmetto*
	Sweet bay	*Magnolia virginiana*
	Geiger tree	*Cordia sebestania*

C-8 Canal Improvements

1) Cut back the canal sidebanks to form a littoral shelf 10 feet wide (back from 18" below the waters edge) by 7,000 feet long (parallel to waters edge) to an approximate depth of 3 feet NGVD such that the littoral shelf bottom edge is approximately 18" below the canal surface water. Excavated material could be used as cover for a nearby landfill.

2) Plant the littoral shelf with wetland plant materials as follows:
a) adjacent to the canal – submerged vegetation zone - plant two staggered rows of bare root (BR) plant material, 12" on center (OC) for the entire 7,000 feet. Examples: eel grass *(Vallisneria americana),* widgeon-grass *(Ruppia maritima*), lemon bacopa *(Bacopa carolinana*).
b) adjacent to the submerged vegetation zone – intertidal zone - plant one row of 1 gallon, plant material 24" OC for the entire 7,000 feet. Examples: arrow-arum *(Peltandra virginica*), duck potato *(Sagittaria lancifolia*), red ludwigia *(Ludwigia repens*).
c) adjacent to the intertidal zone – upper tidal zone - plant one row of plant material 30" OC for the entire 7,000 feet. Examples: soft rush *(Juncus effusus*) (T), wild rice *(Zizania aquatic*), southern wild rice *(Zizaniopsis miliacea*).
d) adjacent to the upper tidal zone – shrub zone - plant small woody shrub material, 5' OC for the entire length interspersed among the upper tidal plant material. Examples: buttonbush *(Cephalanthus occidentalis*), elderberry *(Sambuscus canadensis*), black haw *(Viburnam obovatum*).

3) Compact a 5-foot wide strip of the existing right-of-way – subgrade to 95% and install a 2" thick, Class II bituminous concrete trail, 5 foot wide for a distance of 7,000 linear feet.

4) Install 11 interpretive signs adjacent to the paved trail that describes and illustrates the proposed environmental restoration project.

C-9 Canal Improvements

1) Cut back the canal sidebanks to form a wet littoral shelf 15 feet wide (back from 18" below the waters edge) by 9,400 feet long (parallel to waters edge) to an approximate depth of 3' NGVD feet such that the littoral shelf bottom edge is approximately 18" below the canal surface water level. The wet littoral shelf will slope up to existing grade and at that point a 10-foot wide shrub/tree zone will be developed. The shrub/tree zone will remain at the existing right-of-way grade. Place excavated material on the south bank of C-9 from Station #48000 to Station #50000.

2) Plant the littoral shelf with native plant materials as follows:

adjacent to the canal – submerged vegetation zone (18 - 12 inch deep water) - plant five staggered rows (5 feet wide) of bare root (BR) wetland plant material, 12" on center (OC) for the entire 9,400 feet. Examples: eel grass (Vallisneria americana), widgeon-grass (*Ruppia maritima*), lemon bacopa (*Bacopa caroliniana*).

adjacent to the submerged vegetation zone – intertidal zone (12 - 6 inches deep) - plant three staggered rows (5 feet wide) of 1 gallon wetland plant material 24" OC for the entire 9,400 feet. Examples: arrow-arum (*Peltandra virginica*), duck potato (*Sagittaria lancifolia*), red ludwigia (*Ludwigia repens*).

adjacent to the intertidal zone – upper tidal zone (6 inches - dry) - plant three staggered rows (5 feet wide) of plant material, 30" OC for the entire 9,400 feet. Examples: soft rush (*Juncus effusus*), wild rice (*Zizania aquatic*), southern wild rice (*Zizaniopsis miliacea*).
Shrub/tree zone – shrub zone (10 feet wide) - plant small woody shrub material (10 feet wide), 5' OC for the entire length. Examples: buttonbush (*Cephalanthus occidentalis*), elderberry (*Sambuscus canadensis*), black haw (*Viburnam obovatum*).

3) Compact a 10-foot wide strip of the existing right-of-way - subgrade to 95% and install a 2" thick, Class II bituminous concrete trail, 10 feet wide for a distance of 21,000 linear feet.

4) Install 15 interpretive signs adjacent to the paved trail that describes and illustrates the proposed environmental restoration project.

VI. POTENTIAL ADVERSE AND BENEFICIAL EFFECTS OF THE PROJECT

A. Construction-Related Effects

Construction activities will likely produce short-term impacts to water quality (*i.e.*, increase in suspended solids) due to disruption of sediments during the bank-cutting process. This action may also result in mobilization of contaminants that have been sequestered in sediments. The operation of heavy equipment will result in short-term disruption to wildlife activity in and adjacent to the canals. Disturbance to adjacent upland soils is also likely as a result of heavy equipment use and construction of recreational trails. Proposed project construction will be land based. Turbidity curtains will be used to contain construction related turbulence created by the littoral shelf excavation and plantings.

B. Beneficial Effects on Fish and Wildlife Resources

Planting of vegetation throughout the canal's littoral zone should provide improvement to water quality through the removal of nutrients via plant uptake. Additional benefits resulting from the creation of this littoral area include additional control of erosion from adjacent upland areas and attenuation of stormwater runoff into the canal itself. The implementation of this project is anticipated to improve dissolved oxygen levels within the canal littoral areas and provide additional wildlife shelter and forage habitat as a result of the littoral plantings. The plantings on the upper edge of canal banks should provide roosting habitat for birds, cover for small mammals, amphibians and reptiles.

C. Summary of Consultation under the Endangered Species Act

The Corps has determined (letter dated October 5, 2001), that the proposed C-8 and C-9 canal restoration projects will not likely adversely affect the West Indian manatee, wood stork, and eastern indigo snake. The Corps has agreed to implement West Indian manatee protection construction conditions as well as standard protection measures for the eastern indigo snake in an effort to minimize any potential effects related to construction activities for this project. The Service has concurred with this determination (letter dated October 16, 2001) and concluded section 7 consultation under the ESA for this project.

VII. EVALUATION OF THE PROJECT

This project should promote an increase in the biological diversity and species abundance of the canals, which should in turn enhance the fish populations and provide additional ecological and recreational values. The project also includes the construction of recreational trails adjacent to existing canals. The construction and successful operation of this project has the potential to improve fish and wildlife habitat within sections of the C-8 and C-9 canal systems. The project's ability to provide stated benefits relative to fish and wildlife resources and recreation will be dependent upon monitoring and maintenance. The local sponsor will need to demonstrate success of project through a monitoring program that will likely include regular maintenance actions (such as trash and debris removal) as well.

VIII. RECOMMENDATIONS

The Service believes that the following recommendations should be incorporated for the C-8 and C-9 canal restoration project to maximize beneficial effects to fish and wildlife resources:

1. Prior to construction, sediments in areas to be excavated should be sampled (using standardized protocols) and analyzed for concentrations and bioavailability of potential toxins, such as metals and pesticide residues.

2. During construction, Best Management Erosion and Sedimentation Control Practices should be utilized to minimize turbidity downstream. This should include utilization of silt screens, floating booms, etc. Construction should be minimized during rain events and vegetative cover on exposed canal banks should be established as soon as is practicable.

3. Sediments removed from the canal banks should be disposed off-site at appropriate locations and not within the canal flood plain. The Service recommends that the project planning process provide for an estimate of the quantity of disposed material in order to plan for necessary disposal locations.

4 Littoral shelves created on the canal banks should be configured to provide a slight slope instead of a flat slope to reduce deposition of material and filling of planted areas. Additionally, the Service recommends that, within that portion of the C-9 canal adjacent to the Pro Player Stadium, littoral shelves be constructed on the opposite side of the canals from the proposed recreational trails. This should result in less disruption to wildlife utilizing these areas during times when activities are occurring at the stadium.

5. Long term maintenance of the canals is the responsibility of the SFWMD. The Service recommends that the SFWMD coordinate with local groups/agencies such as the Adopt a Canal program to assist with maintenance responsibilities. —

6. The project design, construction, and monitoring should be closely coordinated with representatives from Miami-Dade Department of Environmental Resources Management (DERM) and Florida Department of Environmental Protection as these agencies have been working together on canal management issues. For example, the location of existing discharge culverts and the potential requirement for riprap within these areas will need to be evaluated relative to proposed littoral zones. The Service recommends that *Juncus* sp. or *Scirpus* sp. be used for planting in the upper tidal zone rather than the common reed (*Phragmites* sp.). Monitoring should be conducted on a quarterly basis in order to evaluate plant survival and need for control of exotic/nuisance plants.

7. Additionally, the operation schedule for the two canals should be reviewed in order to evaluate as to whether these operations are consistent with project objectives and to minimize excessive flooding and scouring of planted littoral zones.

8. The development of interpretive signs and trail development should be closely coordinated with county park outreach staff and involve local schools in the process.

9. The Service also recommends that this project be coordinated with the Florida Fish and Wildlife Conservation Commission for technical assistance related to establishing fish attractors and/or fisherman access points as part of the proposed project.

10. The Service recommends that recreational trails be constructed of mulch or other pervious material instead of concrete. Mulch provides a substrate that is absorbent to rainfall and should contribute to the attenuation of stormwater runoff into the canal.

11. The Service agrees with informal comments received from the Florida Fish and Wildlife Conservation Commission that a heterogeneous littoral zone will be more ecologically advantageous than a homogeneous shelf. Therefore we recommend that the canal banks and newly created littoral zones be designed in order to create variation in shelf depths and widths with a diversity of flora so as to provide additional benefits to fishes and wading birds.

Summary of Position

The proposed improvements to littoral areas of existing flood control canals, with the inclusion of the above recommendations, should provide improvements to fish and wildlife habitat. The creation of functioning littoral wetlands should promote biological diversity and productivity within portions of the canal and secondarily provide improvements to water quality. Enhancements to adjacent upland areas of the canals provide additional opportunities for recreational use, including walking, jogging, bicycling, fishing and bird watching, and provide added recreational value to the surrounding communities.

X. LITERATURE CITED

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Figure 1 C-8 Location Map

Figure 2 C-9 Location Map

APPENDIX A, Concurrence Letter from National Marine Fisheries Service

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

October 22, 2001

Mr. James Slack
U.S. Department of the Interior
Fish and Wildlife Service
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

Dear Mr. Slack:

The National Marine Fisheries Service (NMFS) has reviewed your letter dated September 25, 2001, and the Draft Fish and Wildlife Coordination Act Report (CAR), prepared by the U.S. Fish and Wildlife Service (FWS) for the **Biscayne Canal (C-8) and the Snake Creek Canal (C-9) Environmental Restoration Projects**. The proposed projects involve creation and enhancement of littoral areas within the C-8 and C-9 flood control canals and construction of recreational trails adjacent to the canals. The goals of the restoration projects are to enhance fish and wildlife habitat, improve water quality within the canals, and to provide improve local recreational opportunities.

According to the draft CAR, restoration activities within the C-8 Canal area include an approximately 7,000-foot-long segment located between NW 27th Avenue and State Road 9. The restoration activities within the C-9 Canal area include an approximately 9,400-foot-long segment located between 37th Avenue and the Florida Turnpike. Both projects involve excavating the canal sidebanks to form a littoral shelf and planting vegetation from the subtidal zone up to upper tidal zone. The proposed project includes a recreational trail along the existing right-of-way and interpretive signs describing the environmental restoration project.

We concur with the recommendations of the FWS regarding the project design and implementation. In particular, the NMFS agrees that the following issues should be incorporated into the C-8 and C-9 Environmental Restoration Projects:

1. Sediments in the areas to be excavated should be sampled for potential toxins, including heavy metals, pesticides, and herbicides.

2. Proper turbidity control measures should be employed during construction to minimize impacts to aquatic resources in the area and downstream from the construction activities.

3. Excavated sediments should be properly disposed off-site and not within the canal flood plain.

4. A monitoring plan should be developed to assess the success of the restoration project and to provide periodic evaluation of the project in order to ameliorate the design, if necessary.

It is the NMFS's assessment that the proposed restoration project, with the inclusion of recommendations discussed in the draft CAR, would improvement fish and wildlife habitat. In addition to increasing the quantity and quality of habitat that is available to fishery resources, water quality improvements should be realized in the C-8 and C-9 Canals and these improvements should benefit the receiving waters of Biscayne Bay.

We appreciate the opportunity to provide these comments. Related correspondence should be addressed to the attention of Mr. Mike Johnson at our Miami Office. He may be reached at 11420 North Kendall Drive, Suite #103, Miami, Florida 33176, or by telephone at (305) 595-8352.

Sincerely,

David H. Rackley

for

Andreas Mager, Jr.
Assistant Regional Administrator
Habitat Conservation Division

cc:
EPA, WPB
DEP, WPB
FFWCC, Tallahassee
FWS, Vero Beach
F/SER4
F/SER43-Johnson

APPENDIX IV

FLORIDA COASTAL ZONE MANAGEMENT PROGRAM
FEDERAL CONSISTENCY EVALUATION PROCEDURES

1. Chapter 161, Beach and Shore Preservation.

The intent of the coastal construction permit program established by this chapter is to regulate construction projects located seaward of the line of mean high water and which might have an effect on natural shoreline processes.

Response: This chapter is not applicable to the C-9 Environmental Restoration Project.

2. Chapters 186 and 187, State and Regional Planning.

These chapters establish the State Comprehensive Plan which sets goals that articulate a strategic vision of the State's future. Its purpose is to define, in a broad sense, goals and policies that provide decision-makers directions for the future and provide long-range guidance for an orderly social, economic, and physical growth.

Response: The proposed work has been planned with the cooperation of the State and will be coordinated with relevant agencies.

3. Chapter 252, Disaster Preparation, Response and Mitigation.

This chapter creates a State emergency management agency with authority to provide for the common defense; to protect the public peace, health and safety; and to preserve the lives and property of the people of Florida.

Response: This chapter is not applicable to the C-9 Environmental Restoration Project.

4. Chapter 253, State Lands.

This chapter governs the management of submerged State lands and resources in State lands. This includes archeological and historic resources; water resources; fish and wildlife resources; beaches and dunes; submerged grass beds and other benthic communities; swamps, marshes and other wetlands; mineral resources; unique natural features; submerged lands; spoil islands; and artificial reefs.

Response: The project has been planned with the technical advice of the Florida Department of Environmental Protection (FDEP) and other State of Florida agencies. The project would preserve the majority of wetlands on-site, and would comply with pertinent State regulations and the intent of this chapter.

5. Chapters 253, 259, 260, and 375, Land Acquisition.

These chapters authorize the State to acquire land to protect environmentally-sensitive areas.

Response: There are environmentally-sensitive lands in the project boundaries. However, this project does not interfere with the authority set forth in these chapters.

6. Chapter 258, State Parks and Aquatic Preserves.

This chapter authorizes the State to manage State parks and preserves. Consistency with the statute would include consideration of projects that would directly or indirectly adversely impact park property, natural resources, park programs, management, or operations.

Response: This project is located in the north Miami area and runs through local, city and county parks before emptying into Biscayne Bay Aquatic Preserve. The With Project conditions are not anticipated to result in a direct or indirect adverse impacts.

7. Chapter 267, Historic Preservation.

This chapter establishes the procedures for implementing the Florida Historic Resources Act responsibilities.

Response: This project has been coordinated with the Florida State Historic Preservation Officer. Historic preservation compliance will be completed to meet all responsibilities under Chapter 267.

8. Chapter 288, Economic Development and Tourism.

This chapter directs the State to provide guidance and promotion of beneficial development through encouraging economic diversification and promoting tourism.

Response: Economic contribution from the project area would not be compromised by this action.

9. Chapters 334 and 339, Public Transportation.

These chapters authorize the planning and development of a safe, balanced, and efficient transportation system.

Response: There would be no impacts to public transportation systems associated with this action.

10. Chapter 370, Saltwater Living Resources.

This chapter directs the State to preserve, manage, and protect the marine, crustacean, shell, and anadromous fishery resources in State waters; to protect and enhance the marine and estuarine environment; to regulate fishermen and vessels of the State engaged in the taking of such resources in or without State waters; to issue licenses for taking and processing products of fisheries; to secure and maintain statistical records of the catch of each such species; and to conduct scientific, economic, and other studies and research.

Response: The provisions of this chapter are not impacted by proposed work on C-9.

11. Chapter 372, Living Land and Freshwater Resources.

This chapter establishes the Florida Game and Fresh Water Fish Commission and directs it to manage freshwater aquatic life and wild animal life and their habitat to perpetuate a diversity of species with densities and distributions which provide sustained ecological, recreational, scientific, educational, aesthetic, and economic benefits.

Response: Coordination with Florida Game and Fresh Water Fish Commission will determine if this action is consistent with State policies and practices as set forth in this chapter.

12. Chapter 373, Water Resources.

This chapter provides the authority to regulate the withdrawal, diversion, storage, and consumption of water.

Response: This work does not involve water resources as described in this chapter.

13. Chapter 376, Pollutant Spill Prevention and Control.

This chapter regulates the transfer, storage, and transportation of pollutants and the cleanup of pollutant discharges.

Response: This action does not involve the transportation or discharging of pollutants. Environmental protection measures would be employed during construction and operation of the site to avoid inadvertent spills or other sources of pollution. Therefore, this action would be in compliance with this chapter.

14. Chapter 377, Oil and Gas Exploration and Production.

This chapter authorizes the regulation of all phases of exploration, drilling, and production of oil, gas, and other petroleum products.

Response: This work does not involve the exploration, drilling, or production of oil, gas, or other petroleum product and, therefore, does not apply.

15. Chapter 380, Environmental Land and Water Management.

This chapter establishes criteria and procedures to assure that local land development decisions consider the regional impact nature of proposed large-scale development.

Response: The proposed construction of the C-9 Environmental Restoration Project was coordinated with the Department of Community Affairs during the planning stage and, therefore, the work would be consistent with the intent of this chapter.

16. Chapter 388, Arthropod Control.

This chapter provides for a comprehensive approach for abatement or suppression of mosquitoes and other pest arthropods in the State.

Response: The work would not further the propagation of mosquitoes or other pest arthropods.

17. Chapter 403, Environmental Control.

This chapter authorizes the regulation of pollution of the air and waters of the State by the FDEP.

Response: Water quality certification from the FDEP would be required for this project. No air pollution permits are required for the project. Effects of the operation of construction equipment on air quality would be minor and conform to State of Florida emission standards. Therefore, the work would comply with this chapter.

18. Chapter 582, Soil and Water Conservation.

This chapter establishes policy for the conservation of the State soil and water through the Department of Agriculture. Land use policies would be evaluated in terms of their tendency to cause or contribute to soil erosion, or to conserve, develop, and utilize soil and water resources both on-site or in adjoining properties affected by the work. Particular attention would be given to work on or adjacent to agricultural lands.

Response: This work does not involve agricultural lands as described in this chapter.

APPENDIX V

PERTINENT CORRESPONDANCE

South
Florida
Regional
Planning
Council

January 7,2000

The Honorable Carrie Meek
United States Representative,
17th District
401 Cannon House Office Building
Washington, DC 20515

Dear Congresswoman Meek:

I have requested full copies of the Master Plan for you and Senator Meek. Mr. David Henderson, Bicycle-Pedestrian Program Coordinator for the MPO, is assisting me with this request and has requested a reprinting of the publication. In the meantime please find herewith an Executive Summary of the project, which includes a map illustrating the proposed North Dade Greenways System, as well as information that relates specifically to the proposed Snake Creek Trail.

What a pleasant surprise it was to see you recently at the Everglades Coalition's Annual Conference. As I mentioned to you briefly at the conference, during my research regarding existing efforts to develop recreational trails and greenways throughout Miami-Dade County I found a publication entitled the "North Dade Greenways Master Plan" (Master Plan) which was published by the Miami- Dade County Metropolitan Planning Organization (MPO) and Florida International University (FIU) in December 1997. This report complements the "South Dade Greenways Master Plan" and identifies corridors which can be connected to create an integrated system of "greenways" that provide a variety of alternative transportation and recreational opportunities for county residents.

As I looked through the report I discovered that one of the identified corridors runs along the right- of-way of the C9 or Snake Creek Canal. You may recall that in our December 14th discussion of possible recreational corridors along the C9, one of the areas that we highlighted because of its potential as a recreational corridor is the area adjacent to the Pro Player Stadium. Approximately one mile long (NW 27th Avenue to the Turnpike), this area is part of MPO's proposed 18.6 mile "Snake Creek Trail" and referred to as "Region 3" in the above-mentioned report.

Mr. Henderson was kind enough to spend some time with me discussing various aspects of the Master Plan. When I asked him about the status of funding for the Master Plan, he explained to me that the MPO's Bicycle-Pedestrian Advisory Committee is prioritizing the projects in the North and South Dade Greenways Networks now. They plan to use the results to work with Miami-Dade County Parks and Public Works to obtain funding through the Florida Department of Transportation and the Florida Department of Environmental Protection.

With regards to community participation in the development of this plan, you will see in the " Acknowledgments" section of the report that reference is made to the "participation of numerous citizens in providing valuable guidance through community workshops and meetings ...". I have spoken with Professor Ted Baker, the Project's director and Director for Research of the FIU School of Architecture, to learn more about what groups and communities participated in the development of the plan. The area north of Kendall Drive to the Miami-Dade County line was divided into three horizontal zones and three public meetings were held in each zone. In addition to advertising the

3440 Hollywood Boulevard, Suite 140, Hollywood, Florida 33021
Broward (954) 985-4416, Area Codes 305, 407 and 561 (800) 985-4416
SunCom 473-4416, FAX (954) 985-4417, SunCom FAX 473-4417
e-mail sfadmin@sfrpc.com

public meetings in local newspapers such as the Miami Times and the Miami Herald, the University's outreach efforts included working with the County to contact a range of stakeholders, including homeowner and civic associations, directly. Despite these and other efforts, public attendance averaged about 40 to 50 residents at each workshop.

As you know I was very excited to find this report. I am very encouraged by the work that has already been completed and by our partnership with the South Florida Water Management District and the United States Army Corps of Engineers. I am confident that by working together with the Miami-Dade County MPO and FIU, we will be able to take this project to the next level. In fact, I am pleased to be able to share with you some very exciting news. Professor Baker has generously offered to assist us with the development of the actual physical design of the project when we get to that stage.

Before I close, in response to your request for a briefing on Eastward Ho!, Carolyn Dekle, executive director of the Council, and I would be delighted to meet with you in Washington and update you on the activities and progress of Eastward Ho! and other Council activities if that would be helpful to you. Please let me know if you would like me to work with your staff to arrange a meeting in the near future.

Hoping that you are well and wishing you a successful session, I remain,

Sincerely yours,

Isabel Cosio Carballo
Eastward Ho! Regional Coordinator

ICC/kc

enclosures

cc: The Honorable Kendrick Meek, State Senator, 36th District
Terry Artrip, U .5. Army Corps of Engineers
Ted Baker, Florida International University School of Architecture
Kathy Copeland, South Florida Water Management District
Jeffrey Couch, U .5. Army Corps of Engineers
Jose Fuentes, South Florida Water Management District
David Henderson, Miami-Dade County Metropolitan Planning Organization
Charles Wellon, Office of Congresswoman Meek

FLORIDA DEPARTMENT OF STATE
Sandra B. Mortham
Secretary of State
DIVISION OF HISTORICAL RESOURCES
R.A. Gray Building-;
500 South Bronough Street
Tallahassee, Florida 32399-0250

Director's Office (904) 488-1480
Telecopier Number (FAX) (904) 488-3353

March 20, 1996

Ms. Keri Akers
State Clearinghouse
Department of Community Affairs
2740 Centerview Drive Tallahassee,
Florida 32399-2100

In Reply Refer To:
Robin D. Jackson
Historic Sites Specialist
(904) 487-2333
Project File No.960744

RE: Cultural Resource Assessment Request
SAI# FL9602290118C
Scoping Letter for the Draft Environmental Impact Statement for the C- 7, C-8, and C-9 (North Dade) Canals General Reevaluation Report (GRR)
Dade County, Florida

Dear Ms. Akers:

In accordance with the provisions of Florida's Coastal Zone Management Act and Chapter 267, *Florida Statutes,* as well as the procedures contained in 36 C.F.R., Part 800 ("Protection of Historic Properties"), we have reviewed the referenced project(s) for possible impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places,* or otherwise of historical or architectural value.

It is the opinion of this agency that because of the project nature it is considered unlikely that archaeological or historical sites will be affected. Therefore, it is the opinion of this office that the proposed project will have no effect on any sites listed, or eligible for listing in the National Register. The project may proceed without further involvement with this agency.

If you have any questions concerning our comments, please do not hesitate to contact us. Your interest in protecting Florida's historic properties is appreciated.

Sincerely,

.~~~

George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/Jrj
xc: Jasmin Raffington, FCMP-DCA

Archaeological Research (904) 487-2299
Florida Folklife Programs (904) 397-2192
Historic Preservation (904) 487-2333
Museum of Florida History (904) 488-1484

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

September 25,2001

Mr. James C. Duck
Chief, Planning Division
Army Corps of Engineers
P.0. Box 4970
Jacksonville, Florida 32232-0019

Attn: Paul Stevenson

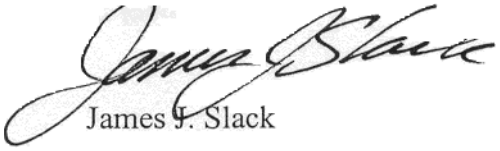
Dear Mr. Duck:

The attached draft Fish and Wildlife Coordination Act Report is submitted for your review in compliance with the Scope of Work for the Biscayne Canal (C-8) and Snake Creek Canal (C-9) Environmental Restoration Projects in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) (FWCA) and section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

The Service requests, prior to completion of the final report, that the your office complete a biological evaluation as to the effects of this project to federally-listed species and provide an effect determination to listed and candidate species and designated and proposed critical habitat in accordance with section 7 of the ESA.

Copies of this draft report have been sent to representatives of the Florida Fish and Wildlife Conservation Commission and the National Marine Fisheries Service for their concurrence. A final Fish and Wildlife Coordination Act Report will be prepared once concurrence from these agencies has been received. Once finalized, this report will constitute the Secretary of the Interior's views and recommendations for these canal restoration projects in accordance with section 2 (b) of the FWCA.

Sincerely yours,



James J. Slack

Field Supervisor
South Florida Ecological Services Office

Enclosure

cc: Florida Fish and Wildlife Conservation Commission, Vero Beach, FL (Attn: Joe Walsh)
Florida Fish and Wildlife Conservation Commission, Boca Raton, FL (Attn: Paul Shafland)
National Marine Fisheries Service, Miami, FL (Attn: Mike Johnson)
Fish and Wildlife Service, Atlanta, GA (Attn: Cynthia Dohner)

If you have questions or comments regarding the findings and recommendations in this report, please contact Betty Grizzle at 561-562-3909, ext. 269. We appreciate the cooperation of the local sponsor, the South Florida Water Management District, and Dial Cordy and Associates, Inc. in the preparation of this report.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

October 22, 2001

Mr. James Slack
U.S. Department of the Interior
Fish and Wildlife Service
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

Dear Mr. Slack:

The National Marine Fisheries Service (NMFS) has reviewed your letter dated September 25, 2001, and the Draft Fish and Wildlife Coordination Act Report (CAR), prepared by the U.S. Fish and Wildlife Service (FWS) for the **Biscayne Canal (C-8) and the Snake Creek Canal (C-9) Environmental Restoration Projects**. The proposed projects involve creation and enhancement of littoral areas within the C-8 and C-9 flood control canals and construction of recreational trails adjacent to the canals. The goals of the restoration projects are to enhance fish and wildlife habitat, improve water quality within the canals, and to provide improve local recreational opportunities.

According to the draft CAR, restoration activities within the C-8 Canal area include an approximately 7,000-foot-long segment located between NW 27th Avenue and State Road 9. The restoration activities within the C-9 Canal area include an approximately 9,400-foot-long segment located between 37th Avenue and the Florida Turnpike. Both projects involve excavating the canal sidebanks to form a littoral shelf and planting vegetation from the subtidal zone up to upper tidal zone. The proposed project includes a recreational trail along the existing right-of-way and interpretive signs describing the environmental restoration project.

We concur with the recommendations of the FWS regarding the project design and implementation. In particular, the NMFS agrees that the following issues should be incorporated into the C-8 and C-9 Environmental Restoration Projects:

1. Sediments in the areas to be excavated should be sampled for potential toxins, including heavy metals, pesticides, and herbicides.

2. Proper turbidity control measures should be employed during construction to minimize impacts to aquatic resources in the area and downstream from the construction activities.

3. Excavated sediments should be properly disposed off-site and not within the canal flood plain.

4. A monitoring plan should be developed to assess the success of the restoration project and to provide periodic evaluation of the project in order to ameliorate the design, if necessary.

It is the NMFS's assessment that the proposed restoration project, with the inclusion of recommendations discussed in the draft CAR, would improvement fish and wildlife habitat. In addition to increasing the quantity and quality of habitat that is available to fishery resources, water quality improvements should be realized in the C-8 and C-9 Canals and these improvements should benefit the receiving waters of Biscayne Bay.

We appreciate the opportunity to provide these comments. Related correspondence should be addressed to the attention of Mr. Mike Johnson at our Miami Office. He may be reached at 11420 North Kendall Drive, Suite #103, Miami, Florida 33176, or by telephone at (305) 595-8352.

Sincerely,

David H. Rackley

for

Andreas Mager, Jr.
Assistant Regional Administrator
Habitat Conservation Division

cc:
EPA, WPB
DEP, WPB
FFWCC, Tallahassee
FWS, Vero Beach
F/SER4
F/SER43-Johnson

October 5, 2001

Planning Division
Environmental Branch

Mr. James J. Slack
Field Supervisor
U.S. Fish and Wildlife Service 1339
20th Street
Vero Beach, Florida 32960

Dear Mr. Slack:

This is in reference to the C-8 and C-9 Section 1135 Environmental Restoration Study, which we are currently conducting. Enclosed is a Biological Assessment pursuant to Section 7 (a) of the Endangered Species Act. The U.S. Army Corps of Engineers has determined that the proposed action will not adversely affect any listed species under the jurisdiction of the U. S. Fish and Wildlife Service.

Your concurrence on this determination is requested. If you have any questions or need any additional information, please contact Mr. Paul Stevenson at 904-899- 5049.

Sincerely,

James C. Duck
Chief, Planning Division

Enclosure

bcc:
CESAJ-PD-PN (B. Foster)

PCS Stevenson/CESAJ-PD-ES/5049 / aes 10-5-01
Dupes/CESAJ-PD-ES
Dugger/CESAJ-PD-E
Couch/CESAJ-DR-S
Duck/CESAJ-PD

L: group/pdes/pablo/C-8&C-9Sect7NoEfft

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

October 16, 2001

Mr. James C. Duck
Chief, Planning Division
Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attention: Mr. Paul Stevenson

Dear Mr. Duck:

This letter acknowledges the Fish and Wildlife Service's (Service) receipt on October 11,2001, of your letter and attached biological assessment dated October 5,2001, requesting concurrence under section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.)* (ESA). The consultation concerns the possible effects of the proposed C-8 and C-9 Canal Environmental Restoration Projects in Miami-Dade County on the endangered West Indian manatee *(Trichechus manatus),* the endangered Wood Stork *(Mycteria americana),* and the threatened Eastern Indigo snake *(Drymarchon corais couperi).* We have assigned Service Log Number 4-1-02-1-452 to this consultation.

The objectives of the C-8 and C-9 canal restoration projects are to provide for ecological enhancement of littoral areas within existing flood control canals and create additional recreational opportunities adjacent to the canal structures.

The biological assessment prepared by your agency states that standard West Indian manatee (manatee) protection construction conditions will be implemented for this project to minimize impacts to this species during construction activities and you have therefore determined that the proposed project will not likely adversely affect the manatee. Because the implementation of these conditions will provide surveillance, management, and control that will minimize disturbance and ensure the safety of the manatee within construction areas, the Service concurs with your effect determination for the manatee. Your letter indicates that the project will not likely adversely affect the Wood Stork and an electronic message, dated October 15, 2001, (P. Stevenson, pers. comm.) indicates that you will require surveys of the project sites to document nesting activity prior to construction. These surveys will provide additional assurances that potential impacts to the Wood Stork are minimized and we concur with your effect determination for this species. Stated within the biological assessment and clarified in an electronic message, dated October 15, 2001, (P. Stevenson, pers. comm.) your agency has agreed to implement standard protection measures for the Eastern Indigo snake in an effort to minimize potential effects to this species related to construction activities for this project. These protection

measures ensure that education materials will be provided to construction personnel with instructions as to how to avoid impacts to the Eastern Indigo snake.
The Service concurs with your not likely to adversely affect determination for this species.

This concludes section 7 consultation on the C-8 and C-9 Canal Environmental Restoration Projects. We appreciate your efforts to protect listed species. If you have any questions regarding this letter, please contact Betty Grizzle of this office at 561-562-3909, extension 269.

Sincerely yours,

James J. Slack
Field Supervisor
South Florida Ecological Services Office

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

December 18,2001

James C. Duck
Chief, Planning Division
U. S. Army Corps of Engineers
P. 0. Box 4970
Jacksonville, Florida 32232-0019

Attention: Paul Stevenson

Dear Mr. Duck:

This letter and the accompanying report constitute the views and recommendations of the Fish and Wildlife Service (Service) relative to the Biscayne Bay (C-8) and Snake Creek Canal (C-9) Environmental Restoration Projects in Miami-Dade County, Florida. The enclosed Fish and Wildlife Coordination Act (FWCA) report is provided in accordance with the FWCA (16 U.S.C. 661 *et seq.)* and section 7 of the Endangered Species Act (ESA) of 1973, as Amended (16 U.S.C. 1531 *et seq.).* A draft report was submitted to your office on September 24, 2001. We have received a letter of concurrence by the National Marine Fisheries Service (NMFS) (Appendix A) and incorporated additional informal comments by the Florida Fish and Wildlife Conservation Commission (FWC).

With the concurrence of the NMFS and the FWC, this report represents the Secretary of the Interior's section 2(b) report in accordance with the FWCA. Submission of this report fulfills the requirements of the National Transfer Fund Agreement and the Scope of Work for the fiscal year 2001 activities relative to the Biscayne Bay (C-8) and Snake Creek Canal (C-9) Environmental Restoration Projects.

We appreciate the opportunity to participate in the review and planning of environmental restoration projects and look forward to working on this project with your agency and the local sponsor. If you have questions as to the findings and recommendations of this report, please contact Michael Abney at 561-562-3909, ext. 283.

Sincerely yours,

~James J. Slack
Field Supervisor
South Florida Ecological Services Field Office

Enclosure (1)

cc:
FWS, Atlanta, GA (Cynthia Dohner)
USGS, Miami, FL (Ronnie Best)
FWC, Vero Beach, FL (Joe Walsh)
FWC, Boca Raton, FL (Paul Shafland)
NMFS, Miami, FL (Mike Johnson)

MAY 10 2002

Planning Division
Environmental Branch

Mr. Mike Johnson
Fisheries Biologist
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
11420 North Kendall Drive, Suite #103
Miami, Florida 33176

Dear Mr. Johnson:

This is in reference to the Snake Creek (C-9) Environmental Restoration Report in North Miami, Miami-Dade County, Florida area (see enclosed Figure 1). Thank you for your telephone response and advice about Essential Fish Habitat (EFH) coordination for the referenced project. The U.S. Army Corps of Engineers (Corps) received your October 22, 2001 response letter to the Draft U.S. Fish and Wildlife Service (FWS) Coordination Act Report (CAR) prepared for C-8 and C-9 which stated your concurrence with their recommendation.

The proposed C-9 restoration project will not impact C-9 bottom habitat or wetlands, is in freshwater and proposes to improve water quality delivered to Biscayne Bay. The project will excavate littoral shelves from the adjacent C-9 rights-of-way (ROW) and breach the soil barrier once completed. Riparian zones are to be planted adjacent to the littoral shelves on their upland side. Upland hammock areas adjacent to the C-9 ROW fenceline are also proposed. An ancillary recreation component composed of a paved trail, benches, interpretive signage and a pre-fab pedestrian bridge with abutments on dry land and no additional supports are also proposed.

Based on this information and pursuant to the 1996 amendment to the Magnuson-Stevens Fishery Conservation and Management Act, the Corps has determined that the proposed action is not likely to adversely affect any essential fish habitat that may be found within the proposed project area.

Your concurrence on this determination is requested. If you have any questions concerning this project, please contact Mr. Paul Stevenson at 904-899-5049 or via email at paul.c.stevenson@usace.army.mil.

Sincerely,

James C. Duck
Chief, Planning Division

Enclosure

bcc:
CESAJ-DR-S (Keiser)
CESAJ-PD-PF (Gallagher)

Stevenson/CESAJ-PD-ES/als
Dupes/CESAJ-PD-ES
Dugger/CESAJ-PD-E
Keiser/CESAJ-DR-S
Duck/CESAJ-PD

L: \group\pdes\Pablo\NMFSNoEfctEFHLtr.doc

Planning Division
Environmental Branch

SEP 0 5 2001

Mr. Dan Boyar
Senior Environmental Analyst
Rights Of Way Division
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 32406

Dear Mr. Boyar:

The U.S. Army Corps of Engineers (Corps) is partnering with the South Florida Water Management District (SFWMD) to develop alternatives for the Canal 8 and Canal 9, Section 1135, Environmental Restoration Studies. The Corps' preliminary plans are to excavate sloping littoral shelves adjacent to the canal, within the existing canal rights—of-ways. The initial excavation depth will be critical to provide the littoral shelves with standing water depths of 18" -24" directly adjacent to the canal. Wetland plants to provide habitat and help improve canal water quality are proposed. Local residents favor a project recreation trail component. A Preliminary Restoration Plan (PRP) has been developed and coordinated with the Corps South Atlantic Division (SAD) offices in Atlanta, Georgia.

Thank you for returning my phone call this morning and offering to coordinate the enclosed C-8 and C-9 PRPs with the appropriate SFWMD Operations Division personnel. The C-8 and C-9 Operational Schedule information requested for the littoral shelf excavation determinations will be vital to our restoration project calculations and subsequent proposal details. Information concerning utilities with the canal rights-of- ways is another crucial element needed to properly plan the final restoration proposals. The SFWMD comments and requested information are eagerly anticipated.

Direct your questions, comments and response to Mr. Paul Stevenson at (tel) 904-899-5049, (fax) 904-232-3442 or (email) paul.c.stevenson@usace.army.mil.

Sincerely,

James C. Duck
Chief, Planning Division

Enclosures

bcc:
DR-S (J. Couch)
PD-PN (B. Foster)

Stevenson/CEASJ-PD-ES/5049/
Dupes/CESAJ-PD-ES
Dugger/CESAJ-PD-E
Couch/CESAJ-DR-S
CESAJ-PD

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT
3301 Gun Club Road, West Palm Beach, Florida 33406 .(561) 686-8800 .FL WATS 1-800-432-2045 .TDD (561) 697-72574
Mailing Address: P.O. Box 24680, West Palm Beach, FL 33416-4680 .www.sfwmd.gov

LAN 08-02
1010/C-8, C-9

October 12, 2001

Mr. Paul Stevenson
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Mr. Stevenson:

Subject: February 2000 C-8 and C-9 Preliminary Restoration Plans

Reference is made to your letter of September 5,2001 requesting information concerning operational schedules, utilities, and plant materials (verbally requested) for the Corps' C-8 and C-9 Preliminary Restoration Plans. Staff has also included comments concerning operational and design aspects of the subject plans.

Operational Schedule (C-9)

Water levels within the project area/reach are controlled by Structure S-29. The structure is operated to maintain an optimal headwater elevation of +2.0' when sufficient water is available to maintain this level. Enclosed is information concerning the operation of Structure S-29 from the structure manual. The design water surface elevation (MSL) for the reach ranges from +6.58' (below.NW 37th Avenue) to +5.93' (Florida's Turnpike). Source of data is USACE DDM, Part V, Suppl. 15, Plate 5.

Operational Schedule (C-8)

Water levels within the project area/reach are controlled by Structure S-28. The structure is operated to maintain an optimal headwater elevation of + 1.8' when sufficient water is available to maintain this level. Enclosed is information concerning the operation of Structure S-28 from the structure manual. The design water surface elevation (MSL) for the reach ranges from +6.15'(NW 27th Avenue) to +5.85' (State Road 9). Source of data is USACE DDM, Part V, Suppl. 21, Plate 11.

Utilities (C-9)

A cursory review of our records indicates there are numerous permitted existing utilities and facilities within the north and south rights of way of C-9. These consist of drainage culverts (numerous), bridge crossings, a pile supported force main crossing, open channel

connections, buried utilities such as force mains, telephone and cable TV, fence enclosures, aerial powerlines, and a cable TV aerial crossing.

In general, there is more area potentially available for the proposed project along the north right of way due to slightly greater overbank width and greater setback distances of buried utilities from the top of canal bank as compared with the south right of way.

Utilities (C-8)

A cursory review of our records indicates there are numerous permitted existing utilities and facilities within the north right of way of C-8. These consist of drainage culverts, aerial powerline crossings, bridge crossings, buried water main and force mains, associated underground check valves, subaqueous telephone crossing, and guardrail barricades. There is very limited area potentially available along this reach for the project (as currently proposed) due to limited right of way width and force main location. The right of way width increases slightly in the easternmost quarter mile of the reach (east of NW 17th Avenue).

No effort has been made to identify unauthorized encroachments. The final design consultant should be encouraged to diligently inspect the site for any facilities that may impact the project. A survey should be conducted in conjunction with utility marking (Call Sunshine, 1-800-432-4770) prior to designing construction plans for the projects.

If more detailed information concerning specific utilities and facilities within the respective reaches of C-8 and C-9 is desired, copies of this information can be provided under separate cover. Our permit files are also available for review.

Operational Zones and Access

The District's criteria requires a minimum of 100' of clear zone (no above ground facilities) for staging areas on the upstream and downstream sides of all bridges and pile supported crossings. In order to conform with District criteria the project design will need to include adequate setbacks to provide the required clear zones.

The District has a standard which calls for a clear zone 40 feet wide, as measured from the top of the canal bank. This 40 foot wide clear zone was established in order to provide an adequate and efficient equipment operation area adjacent to the canal. Proposals that would diminish the width of the overbank right of way to less than 40 feet would not confonn to district criteria. Similarly, where the existing overbank right of

way is already less than 40 feet in width, narrowing the available width is inconsistent with the intent of District criteria.

The C-9 plan (Figures 3 & 4) indicate excavated areas approximately 27' wide measured from the top of bank. The excavated areas needs to be reduced to 10-15' wide (measured from existing top of bank) so as to allow at least a minimal reach for a crane across the shelves during emergency conditions.

Figures 3 & 4 of the C-8 plan need to include a scale. These Figures indicate excavated shelves approximately 15-27' wide measured from the top of bank. These will need to be reduced in width to only 5-10' so as to provide a minimum overbank width of at least 20' for maintenance access. As previously indicated there is limited overbank available for shelf excavation along C-8 due to limited right of way width and an existing buried force main, which may eliminate excavation altogether.

In addition, access areas (sections of the existing/unaltered canal bank a minimum of 100 feet long) need to be provided between each excavated area/shelf. The shelves should also be staggered along the opposite side of the canal to provide access from unaltered bank areas opposite each shelf.

Design Considerations

The 1 on 2 slope indicated on Figures 3 & 4 should be less steep (1 on 3) for better stability in sandy soils. These slopes will need to be stabilized. Stabilization may include Argentine Bahia sod pegged in place or some other method acceptable to the District. Other plantings (low native groundcovers that can tolerate periodic inundation) may be planted between the lowest rows of sod installed along the slope. Rip-rap or some other form of revetment may also be acceptable.

Figure 5 depicts the outline (top edge) of the proposed littoral shelf areas as being almost rectangular in shape. To reduce erosion due in part to canal flows, the upstream and downstream sides of the shelves should be angled gradually with respect to the canal. To give the project a more natural character, excavation/shelf length may include two or three lengths rather than all being identical.

The overbank area surrounding to the proposed excavated areas/shelves needs to include a 20: 1 backslope away from the canal along with soil compaction and sodding with Argentine Bahia grass. The backsloping should be added to the typical cross sections shown in the plans.

It is suggested that a small pilot project to evaluate the excavated/shelf areas for potential erosion, suitable plant materials, etc. be utilized over a period of one year to help guide the full scale project.

Maintenance Cost

In the plans it is stated that "O&M for this project is estimated at $4,000 a year and the project sponsor (South Florida Water Management District) has agreed to perform this service". Please provide documentation for this statement. Does the $4000 include maintenance of the linear park such as mowing. Control of invasive aquatic exotic vegetation may be problematic and potentially costly if such species colonize the proposed littoral shelf areas. The District believes the project will be more expensive to maintain than is stated.

The District's Miami field Station has indicated the proposed greenway will require additional maintenance for which it is not funded. Typically on going maintenance for greenway projects are provided by local municipalities or the county. If the greenway is not planted with trees, the additional cost for increased flat mowing is estimated to be $17,200 annually. If trees are planted, the cost for small machine mowing, weed eating, exotic vegetation control and tree trimming is estimated at $136,400 annually. The estimated cost for additional spot herbicide treatments is $2000 annually, but would be higher if invasive exotic vegetation becomes problematic. A sponsor is needed from the local municipalities or the county to provide on going maintenance.

Plant Materials

Figure 5 of the plans indicates placement of muck within the shelves and depicts a sill along the waterward edge of the shelves. The Project Modification Features (3b) does not describe such features. Please clarify whether these features are intended in the project design. Note: Muck placement and sill construction would likely increase the cost of the project and raise questions concerning source of muck and vegetation that may be associated with the muck. In addition, a sill is likely to be unstable due to the sandy substrate characteristic in these areas.

In selecting desirable plant species for the project an analysis of the soils should be performed for pH and nutrient content (fertility). Soil samples can be tested through a service provided by the Florida Cooperative Extension Service (IFAS) for a small fee. This information is helpful in determining what plants may grow well in an area.

Plant selection may be facilitated by inspecting the project site to observe species of aquatic plants that currently grow in the area, and at what elevations. Construction of several test shelves would be useful to test a variety proposed plants to determine which grow best and whether invasive exotics invade and compete with the plantings. An unplanted test shelf may colonize naturally with desirable species and/or provide warning that nuisance exotics may colonize instead.

Plant Lists

Enclosed is a copy of Circular 912 Aquascaping for your use. Also enclosed (with comments and suggestions added) is the revised plant list for C-9, which was faxed to the District August 26, 2001. The terms "intertidal" and "tidal" are used in both plans (under project Modification Features, 3b). It is suggested that the term "transitional" be utilized instead in conjunction with elevation ranges (similar to the enclosed "Marsh and Littoral Shelf Plantings" drawing by Aurora. An Aquascape list of freshwater wetland plants is also enclosed for guidance.

In general, species that grow large, are weedy or tend to form thick mats crowding other plants are not recommended and are noted. On the revised plant list for C-9 it should also be noted that all the trees listed (except for cabbage palm) and buttonbush on the shrub list all prefer moist soils. Since the trees and shrubs must be set back 40'+ from the top of canal bank, it is suggested that species that can handle dryer soils be considered instead. Plant selection should only include species that naturally occur in this part of Florida. A copy of the District's right of way plant list has also been enclosed for your use.

Linear Park/Overbank

It is noted that the plant lists also contain sections on trees and shrubs. Please be advised District criteria requires that trees and shrubs be set back at least 40' (landward) of top of bank in order to provide maintenance access to the canal. Small-native" groundcovers and aquatics are exempt from this requirement. Similarly, signs would also need to be set back at least 40'. Other proposed improvements would also need to conform to the District's criteria.

The proposed bike/walking trail will need to be set flush with surrounding grade. The trail will also need to support the District's heavy equipment. Minimally 8" of limerock covered by 1.5-2" of Class S-1 or S-3 modified asphalt is required. The trail as proposed (Project Modification Features -3) would be damaged under the force of heavy

equipment. A possible alternative may be a compacted/rolled limerock trail without pavement features.

Further coordination of the C-8 and C-9 restoration plans should be with Jose Fuentes of the District's Miami-Date Service Center at (305) 377-7274 (extension 7278) and Mercedes Barreras of the Miami Field Station at (305) 513-3420 (extension 7101).

Thank you for the opportunity to comment.

Sincerely,

Daniel E. Boyar
Senior Environmental Analyst
Right of Way Division
Water Resource Operations
South Florida Water Management District

/db
Enclosures

APPENDIX VI

Planting and Monitoring Plan
Canal –9 (Snake Creek Canal)

Ecosystem Restoration
Dade County, Florida
(revised 05/03/02)

BACKGROUND.

The ecosystem restoration plan consists of constructing littoral shelves within the canal, riparian zones adjacent to the littoral shelves and upland hammocks interspersed through the remainder of the canal right of way. The Planting Plan describes the species that will be planted, plant size, planting distribution and costs. The Monitoring and Maintenance Plan describes how planting success will be ensured for the future.

PLANTING PLAN.

Potential Species Plantings in Project Area.

Only **native plant species** will be planted as part of the ecosystem restoration project. Whenever possible species indigenous to this area will be given priority for planting but this will be dependent to availability and reasonable costs. The species information presented here may change as new information becomes available about species that occurred in this area historically and availability a species at the time of planting. However, species not native to this area will **not be** considered for planting as part of this ecosystem restoration project.

Littoral Shelves

There are two extreme concepts regarding planting strategies for littoral shelf plants. First, no wetland plants could be planted and the project could rely solely on natural dispersion of seeds to form a plant community on the newly constructed littoral shelves. Because of the urban nature of the watershed, there are no reliable seed sources of desirable native plants. Also, invasive exotic species generally can out-compete native species on disturbed landscapes. The other extreme would be to increase the likelihood of success by using relatively large numbers of plants, spaced close together. The selected strategy is to plant a minimum number of native plant species, in order to reduce the success of undesirable species from colonizing the area, combined with an aggressive monitoring and maintenance program. The monitoring and maintenance program would ensure the eradication of invasive, exotic species and replacement of dead and ailing plants. The monitoring and maintenance program would conducted every three (3) months for three years after project construction.

Littoral Shelf Vegetation

Wetland plants are adopted to tolerate a wide range of water regimes. However for all wetland plants there are specific water regimes where they thrive and other water conditions that they can tolerate for only so long before they die. The most common wetland restoration mistake is installing plants in water that is too deep or too wet for a particular species. The mindset that if a little bit of water is good for wetland plants, then more water is better, has proven to be devastating to restoration efforts.

Shoreline Species:

Softrush (*Juncus effuses*), Arrowhead (*Sagittaria lancifolia*), Swamplily (*Crinum americana*), Cordgrass (*Spartina bakeri*), Bur-marigold (*Bidens laevis*) Shrubs may also be planted along the wet portion of the shore.

Shallow-water Species:
Eel Grass (*Vallisnera americana*), Soft-Stem Bulrush (*Scirpus validus*), Pickerelweed (*Pontederia cordata*),

Relatively Deep-water Species:
Spatterdock (*Nuphar lutem*), American lotus (*Nelumbo lutea*), Fragrant Water Lily (*Nymphaea odorata*)

Littoral Ledge Plantings
The planting concept is straight forward. Proceeding from the deepest part of the littoral ledge the vegetative plantings would consist of those species listed under Relatively Deep-water, followed by those listed under Shallow-water Species and then Shoreline Species. Water tolerant shrubs could also be added to the shoreline plantings, where appropriate.

Preparation of the Littoral Shelves for Planting.
The newly created shelves will probably have a predominantly limestone bottom, which will have a high pH (low acidity) ranging from 7 to 9. Wetland plants will survive in the low acidity but will not grow. In order to foster plant growth, acidity needs to be raised to a pH of 5.2 to 6.7. To obtain the appropriate pH, and to provide a substrate for plants where needed, material containing at least one percent organic matter would be placed a foot thick over the limestone shelves.

Littoral Shelf Plant Size, Spacing and Cost.
Optimum size plants for this project are the standard four (4) inch plugs.
Four (4) inch wetlands plant plugs cost about $1.65 installed. This for all plants except lotus and water lilies which cost about $7.00 each.
Installed at three (3) foot centers, a 300 foot long, 5 foot wide littoral shelf will require 166 plugs at a cost of $272.90. This equates to $8,000 per acre.
Installed at two (2) foot centers, a 300 foot long, 5 foot wide littoral shelf will require 375 plugs at a cost of $618.75. This equates to $18,000 per acre.

Installation of the four (4) inch plugs at three (3) foot centers is the industry standard. The two (2) foot centers are frequently used where, generally due to regulatory requirements, in order to have a more dense cover early in the restoration or wetland creation process. The three (3) foot center scheme will be used for this project. The final planting plan would not attempt to fill every square foot of littoral shelf area because the installed plant material will fill in open areas within a short time.

Riparian Zone Vegetation

Plantings would generally consist of mixed species of shrubs and herbaceous species. They would begin at the littoral shelf plantings and continue, at a relative steep gradient to the top, and then along the top, of the right of way. In essence they would be an extension of the littoral shelves but the species composition would consist of plants adopted to much dryer conditions.

Large Shrub Species:
Loblolly Bay (*Gordonia lasianthus*), Wax Myrtle (*Myrica*

cerifera) and Dahoon Holly (*Ilex cassine)*

Smaller Shrub Species:
Simpson Stopper (*Myrcianthus fragrans*), Red Anise (*Illicium floridanum*), Coco Plum (*Chyrsobalanus icaco*), Spanish Stopper (*Eugenia foetida*), Myrsine (*Myrsine guianensis*)

Groundcover Species:
Blue flag Iris (*Iris hexagona*), Cinnamon Fern (*Osmunda cinnaomomea*), Golden Canna Lily (*Canna flaccida*), Florida Gamma Grass (*Tripsacum floridanum*) and Bur-Marigold (*Bidens laevis*).

Trees Species:
Bald cypress, sweet bay magnolia, dahoon holly, red maple or pop ash. Tree plantings would be sparse so that they will not constitute a significant canal maintenance problem in the future.

Preparation for Planting:
Material having at least one percent organic matter would be added to the planting area in order to lower pH, where appropriate.

Plant Size, Spacing and Cost:
The most cost effective plant sizes for this project is the industry standard, which consists of 3 gallon shrubs and trees and one (1) gallon herbaceous ground cover. These sizes are preferable, since within a relatively short time (about one year), these plants would produce significant root and shoot growth. The result would be that they would of a comparable size to the larger plants, but healthier because of the relatively rapid growth. The year round growing season in the Dade County area will further larger initial root mass. The year round growing season in the Dade County will further obliterate the distinction between initial planting size.
Shrubs and trees would cost $15.00 each, while herbaceous plants would cost $7.50 each.
All shrubs and trees would be installed at five (5) foot centers and herbaceous plants at three (3) foot centers.
A 300 foot by 5 foot riparian zone segment would require 60 shrubs, 6 trees and 167 herbaceous plants for a total cost of $2,243. This equates to $65,200 per acre.
Plants would need to be watered weekly for the first three months after planting. Cost for three months of watering would be about $10,000 and would also include watering the upland hammocks.

Upland Hammock Vegetation

This habitat would be multi-canopied and composed of those species that provide wildlife habitat value. A typical assemblage of species would consist of saw palmetto, cootie, beauty berry, Fakahatchee grass and slash pine. There would be 43 upland hammocks along the right of way. Each upland hammock would cover a little over 1,500 square feet and would consist of: 10, 3 gallon slash pine at $15.00 each; 5, 3 gallon saw palmetto at $25.00 each; 5, 3 gallon cootie at $25.00 each; 5,3 gallon beauty berry at$15.00 each and 10, 3 gallon Fakahatchee grass at $12.00 each for a total cost of $595.00. This equates to $17,570.00 per acre.

MONITORING AND MAINTENANCE PLAN

Replacing dead plants and eradicating undesirable invasive species is critical to the success of this ecosystem restoration project. Monitoring and maintenance should be performed every three (3) months for the initial three (3) years following project construction. Cost of a three (3) year monitoring and maintenance program would be about $20,000 per year or a total of $60,00 for three (3) years. Corps policy only allows one year of monitoring, though on occasion this has been increased to 15 months.

IMPORTANT COST INFORMATION:

The costs presented are not the official Corps cost estimates that are contained in the main report. The official Corps cost estimates include: contingency costs; Planning, Engineering and Design costs; and costs associated with uncertainty.

ATTACHMENTS

08 March 2002

Mr. Rudy Nyc
141 Anne Boleyn
Mableton, GA 30126

RE: LITTORAL LEDGE AND RIPARIAN ZONE PLANTINGS

Dear Rudy:

As we discussed, enclosed is a simple design that would provide the necessary biological function for these planting zones being established in several canal systems in the Miami, Florida area as follows:

A. Littoral Zone (300' x 5')

375	Wetland plants (4" plugs)	@ $ 1.65	$ 618.75*

All plants installed on 2 foot centers. Species would include soft rush, bulrush, pickerelweed, arrowhead, sand cordgrass, and spikerush.

B. Riparian Zone (300' x 5')

60	Transitional zone shrubs (3g)	@ $ 15.00	$ 900.00
6	Transitional zone trees (3g)	@ $ 15.00	$ 90.00
167	Herbaceous ground cover (1g)	@ $ 7.50	$1,252.50
		Approximate cost	$2,242.50*

All shrubs will be installed on 5 foot centers; herbaceous on 3 foot centers. Shrubs to include cocoplum, wax myrtle, Simpson stopper, pond apple, Virginia willow, or firebush. Trees to include bald cypress, sweet bay magnolia, dahoon holly, red maple or pop ash. Trees added for diversity only.

C. Upland Plantings (Small patches)

10	Slash pine (3g)	@ $ 15.00	$ 150.00
5	Saw palmetto (3g)	@ $ 25.00	$ 125.00
5	Coontie (3g)	@ $ 25.00	$ 125.00
5	Beauty berry (3g)	@ $ 15.00	$ 75.00
10	Fakahatchee grass (3g)	@ $ 12.00	$ 120.00
		Approximate cost	$ 595.00*

* A total of 43 small patches would be required for this portion of the project.

D. Riparian Zone (300' x 5') (**Option 2**)

60	Transitional zone shrubs (7g)	@ $ 40.00	$2,400.00
6	Transitional zone trees (7g)	@ $ 40.00	$ 240.00
167	Herbaceous ground cover (1g)	@ $ 7.50	$1,252.50
		Approximate cost	$3,892.50*

All shrubs will be installed on 5 foot centers; herbaceous on 3 foot centers.
Shrubs to include cocoplum, wax myrtle, Simpson stopper, pond apple, Virginia willow, or firebush.
Trees to include bald cypress, sweet bay magnolia, dahoon holly, red maple or pop ash. Trees added for diversity only.

If you have any further questions, please contact my office as soon as possible.

Sincerely,

Donald Richardson, Ph.D.

DRR/jlr

02 April 2002

Mr. Rudy Nyc
141 Anne Boleyn
Mableton, GA 30126

RE: REVISED - LITTORAL LEDGE AND RIPARIAN ZONE PLANTINGS

Dear Rudy:

As we discussed, enclosed is a simple design that would provide the necessary biological function for these planting zones being established in several canal systems in the Miami, Florida area as follows:

A. Littoral Zone (300' x 5')

166	Wetland plants (4" plugs)	@ $ 1.65	$ 273.90*

All plants installed on 3 foot centers. Species would include soft rush, bulrush, pickerelweed, arrowhead, sand cordgrass, and spikerush.

B. Riparian Zone (300' x 5')

60	Transitional zone shrubs (3g)	@ $ 15.00	$ 900.00
6	Transitional zone trees (3g)	@ $ 15.00	$ 90.00
167	Herbaceous ground cover (1g)	@ $ 7.50	$1,252.50
		Approximate cost	$2,242.50*

All shrubs will be installed on 5 foot centers; herbaceous on 3 foot centers.
Shrubs to include cocoplum, wax myrtle, Simpson stopper, pond apple, Virginia willow, or firebush.
Trees to include bald cypress, sweet bay magnolia, dahoon holly, red maple or pop ash. Trees added for diversity only.

C. Upland Plantings (Small patches)

10	Slash pine (3g)	@ $ 15.00	$ 150.00
5	Saw palmetto (3g)	@ $ 25.00	$ 125.00
5	Coontie (3g)	@ $ 25.00	$ 125.00
5	Beauty berry (3g)	@ $ 15.00	$ 75.00
10	Fakahatchee grass (3g)	@ $ 12.00	$ 120.00
		Approximate cost	$ 595.00*

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Trees to include bald cypress, sweet bay magnolia, dahoon holly, red maple or pop ash. Trees added for diversity only.

If you have any further questions, please contact my office as soon as possible.

Sincerely,

Donald Richardson, Ph.D.

APPENDIX VII

REAL ESTATE APPENDIX

SNAKE CREEK CANAL, C-9
MIAMI-DADE COUNTY, FLORIDA

C-9 CANAL RESTORATION PROJECT

TABLE OF CONTENTS

1. STATEMENT OF PURPOSE

This Real Estate Plan is tentative in nature for planning purposes only and both the final real property acquisition lines and the real estate cost estimates provided are subject to change even after approval of the Feasibility Report.

2. AUTHORIZATION

This feasibility study was performed under the authority of Section 1135 of the Water Resources Development Act (WRDA) of 1986, Public Law (PL) 99-662, as amended by the Water Resources Development Act of 1990. The act reads, in part, as follows:

"The Secretary is authorized to review the operation of water resources projects constructed by the Secretary (Corps built projects) to determine the need for modifications in the structures and operation of such projects for the purpose of improving the quality of the environment in the public interest."

3. PROJECT LOCATION

The Snake Creek Canal, C-9, is located in the cities of North Miami and Carol City, in Miami-Dade and Broward Counties, Florida.

4. PROJECT DESCRIPTION

The project involves a flood control canal constructed by the U. S. Army Corps of Engineers in partnership with the South Florida Water Management District. The purpose of the project is to develop a total watershed plan identifying structural and/or operational modifications of the canal basins. This would reduce flood damages, identify environmental restoration or enhancement opportunities and document the quality of maintenance. The specific site of the canal considered for habitat restoration is an approximately 9,400 feet segment located between NW 37th Avenue and the Florida Turnpike in Miami-Dade County. The area would be planted with a variety of native wetland plants. A paved trail with environmental interpretative signage would be placed along the existing right-of-way.

Several alternatives have been developed and are presently being analyzed. The alternatives are based on different shapes and depths of excavation of littoral shelves along the canal for habitat creation. All alternatives include installing native vegetation and include construction of a path along the canal.

Signs describing the ecosystem restoration will be installed. Other recreational features may also be included.

5. SPONSOR-OWNED LANDS

a. Federal

There are no federally owned lands within the project limits.

b. Non-Federal

The local sponsor for this project is the South Florida Water Management District. All of the alternatives presently being considered for the project would be located within the existing South Florida Water Management District's right-of-way. All construction, disposal and the staging area will be entirely upon the existing right of way along the canal. The Sponsor previously acquired the lands in fee for this project.

6. REAL ESTATE REQUIREMENTS

The proposed project is to be constructed within the existing right-of-way for the Snake Creek Canal, C-9, an approximately 9,400 foot segment located between 37th Avenue, Northwest, and the Florida Turnpike in Dade County, Florida, containing approximately 625 acres of land. South Florida Water Management District acquired the land required for this project in fee as authorized by the Florida Control Act of June 20, 1948, being part of the Central and Southern Florida Project for Flood Control.

The value of these lands was not included in Real Estate's total project cost as lands were certified under the previous federally funded project.

7. ESTATES

There are no estates to be acquired for this project.

8. NAVIGATION SERVITUDE

There are no project lands for which navigational servitude will be exercised.

9. PROJECT MAP

A map of the project area is included at the end of this appendix.

10. INDUCED FLOODING

The proposed modifications will not impact the authorized purposes of the Snake Creek Canal, C-9. A backwater analysis would be performed to verify that the littoral zones would not adversely impact the flood control capability of the canal.

11. REAL ESTATE BASELINE COST ESTIMATE

Lands and Damages:	$0
Acquisition/Administrative Costs	
Federal	
Project Planning	$ 10,000
Non-Federal	
Acquisitions	$ 10,000
Total Acquisition/Administrative Costs	$ 20,000
Contingencies (*25%)	$ 5,000
Total Estimated Real Estate Costs	$ 25,000

South Florida Water Management District owns all of the land required to support construction and operation and maintenance of this project. The dollars included in the real estate cost estimate are for ownership verification and certification of lands.

12. RELOCATION ASSISTANCE BENEFITS

There are no persons or businesses to be relocated as a result of this project.

13. MINERALS

No known minerals exist in the project area.

14. NON-FEDERAL SPONSOR'S AUTHORITY TO PARTICIPATE

The South Florida Water Management District was created by virtue of Florida Statutes, Chapter 373, Section .069. The South Florida Water Management District was created to further the State policy of flood damage prevention, preserve natural resources of the State including fish and wildlife and to assist in maintaining the navigability of rivers and harbors. (There are other enumerated purposes but they are not directly applicable to this project.) The South Florida Water Management District is specifically empowered to

> Cooperate with the United States in the manner provided by Congress for flood control, reclamation, conservation, and allied purposes in protecting the inhabitants, the land, and other property within the district from the effects of a surplus or a deficiency of water when the same may be beneficial to the public health, welfare, safety, and utility. (Section 373.103)

To carry out the above purposes, the South Florida Water Management District is empowered to

> ...hold, control, and acquire by donation, lease, or purchase, or to condemn any land, public or private, needed for rights-of-way or other purposes, and may remove any building or other obstruction necessary for the construction, maintenance, and operation of the works; and to hold and have full control over the works and rights-of-way of the district.
>
> The term works of the district is defined by Section 373.019 to be
>
> ...those projects and works, including, but not limited to, structures, impoundment, wells, and other water courses, together with the appurtenant facilities and accompanying lands, which have been officially adopted by the governing board of the district as works of the district.

Section 373.139 specifically empowers the South Florida Water Management District to acquire fee title to real property and easements therein by purchase, gift, devise, lease, eminent domain, or otherwise for flood control, water storage, water management, and preservation of wetlands, streams and lakes, except that eminent domain powers which may be used only for acquiring real property for flood control and water storage.

15. REAL ESTATE MILESTONES

The Sponsor will certify the availability of lands necessary for construction of the proposed project upon request.

16. PRESENCE OF CONTAMINANTS (HAZARDOUS, TOXIC AND RADIOACTIVE WASTES)

There have been no hazardous or toxic wastes identified within the project area.

17. ATTITUDE OF LANDOWNERS

The only property owner directly affected by the project is the Sponsor itself, who fully supports the proposed federal project. (If additional lands are required to support this project, this statement may change.)

18. M-CACES FOR REAL ESTATE

01	Lands & Damages	$ 0
01AA	Project Planning	$ 10,000
01B--	ACQUISITIONS	
01B20	BY LOCAL SPONSOR (LS)	$ 10,000
01B40	REVIEW OF LS	
TOTAL REAL ESTATE COST EXCLUDING CONTINGENCY		$ 20,000
REAL ESTATE CONTINGENCY (25% COST)		$ 5,000
TOTAL PROJECT REAL ESTATE COST		$ 25,000

APPENDIX VIII

RECREATION RESOURCE APPENDIX

SNAKE CREEK CANAL (C- 9)
SECTION 1135
ENVIRONMENTAL RESTORATION REPORT
Miami-Dade County, Florida
(revised 04/30/02)

1 AUTHORIZATION

The Snake Creek Canal, C-9, was authorized by the Flood Control Acts of June 30, 1948 and September 3, 1954, as part of the Central and Southern Florida Project for Flood Control and under Section 4 of the 1944 Flood Control Act. Section 1135 of the Water Resources Development Act of 1986 (WRDA 86) authorized the U. S. Army Corps of Engineers to undertake environmental improvements to former Corps projects. The Federal Water Project Recreation Act (P.L. 89-72) and the Water Resources Development Act of 1986 (P.L. 99-662) provide additional guidance. The Energy and Water Development Act of 1995 provided authorization to begin design and construction of improvements to the C-7, C-8 and C-9 canals.

Additional authorization guidance for the proposed recreation resources development is contained in CECW-AG, 11 June 1998 Memorandum, Policy Guidance Letter No. 59, Recreation Development at Ecosystem Restoration Projects and EP 1165-2-502, 30 Sep 1999, Checklist of Facilities Which May Be Cost Shared as Part of Recreation Development at Ecosystem Protection and Restoration Projects.

2 BENEFIT CATEGORIES

Study Area

The study area for the recreation benefit analysis is specific to Carol City – Miami Lakes – Opa Locka areas of Dade County and Miramar – Pembroke Pines area of Broward County. The 2000 Draft Florida Statewide Comprehensive Outdoor Recreation Plan (SCORP) identifies the proposed project area as part of Region XI comprised of Broward, Dade and Monroe Counties. Recreation deficits identified by the SCORP for this region includes; bicycle riding areas, freshwater fishing, hiking, nature study, freshwater and saltwater beach activities. The population growth of south Florida will only add to the existing recreation deficits. Regional population figures and future population estimates were not factored into Table 5 because the additional figures would display extreme recreation deficits that in all probability would not be accurate.

Methodology

For the purposes of benefit estimation the capacity method was used to determine the annual recreation days that could be expected at the proposed recreation facilities. Instantaneous capacity factors, daily turnover rates, and weekend verses weekday recreation patterns were used to determine annual visitation. In this region of Florida minor seasonal influences on recreation participation is factored into the capacity equation of outdoor use.

Annual use of the park was calculated as a combination of existing, increased and multi-use recreation. Recreation use was then related to the surrounding proposed project area where recreation resources are proposed. The Canal 9 area was considered to be a high quality recreation resource in determining recreation values. Growth to 378,560 recreation days, or full capacity, was assumed over the project's 50-year life. This represents a potential not actual figure

and is an upper use limit. Some potential activities were not specified, quantified or added to the total recreation days. The Snake Creek Canal (C-9) Section 1135, proposed recreation resources represents a unique opportunity for recreation resources to harmoniously blend with and take advantage of the environmental restoration interpretive experience. No economic recreation demand potential analysis was undertaken for the proposed ancillary recreation resources.

A unit day value was assigned to the recreation experience at the proposed neighborhood recreation area (with and without project). The value was based on Table 1 of the Canal 9, Section 1135, Environmental Restoration Report, which originates from guidance in ER 1105-2-100, page 6-133, Table 6-29, the use of the Table 6-29 criteria and judgment factors was based on the specific judgment factors compared to with and without project conditions. These values, based on characteristics of the proposed facilities, competitive facilities within the Market area, carrying capacities, accessibility and potential environmental experience, are summarized in Table 1, on the following page.

TABLE 1

2.1.1 CRITERIA/JUDGEMENT FACTORS	POINT VALUES With project	without
A. Recreation Experience: 4 plus miles of multi-use paved trail for interpretive/ nature study; jogging; walking; bicycling along water (C-9 Canal), bank fishing; environmental quality and historical habitat improvements.	11	3
B. Availability of Opportunity: 4 plus miles of prime multi-use, waterfront, recreation opportunity; rare bank fishing w/enhanced environmental habitat; rare interpretive experience.	6	3
C. Carrying Capacity: Adequate city-wide facilities proposed – few existing at this time.	11	3
D. Accessibility: Multiple access points from surrounding neighborhoods and adjacent intersecting roadways.	11	10
E. Environmental Quality: Wildlife habitat restoration proposed (littoral, riparian, upland) to provide a high quality holistic environment within dense urban area.	10	5
2.1.1.1 CANAL 9 PROPOSED RECREATION RESOURCES TOTAL POINTS	49	24
Points Conversion to Dollars (FY 01):	$5.93	$3.94

Point value assignments for **Table 1** above are based on ER 1105-2-100, page 6-113, Table 6-29. The Table 6-29 Criteria and Judgment Factors for General Recreation were specifically used as the basis of the estimated point values for the proposed recreation area. Judgment Factors were reviewed after several site visits and coordination with local agencies. The flowing selection factors were used for the criteria outlined in **Table 1**.

∗ The Canal 9 Recreation Facility experience will add to the existing Canal 9 recreation opportunities afforded by the linear waterfront canal right-of-ways (ROW), in a growing region, and provide specific recreation amenities (as outline in Table 1, part A.) for expanding local populations. The environmental restoration components (trees, shrubs, groundcovers and aquatic plants) could help to ameliorate the hot summer suns with shade and improved environmental resources of the existing austere landscape. The point value rating is estimated in the middle upper end of the judgment factor scale because of the high quality general activities that would sustain a citywide population in the Carol City/Opa Locka area. The without project values are based on the existing site conditions, use at this time, and the Criteria/Judgment Factors for the General Recreation as laid out in Table 6-29 of ER 1105-2-100.

∗ The availability of opportunity rating is based upon current local recreation facilities near the communities in the proposed recreation resource location. A 25 mile radius around the proposed project area represents a fairly dense urban population. A 50 mile radius would include the Everglades, Miami Beach and a couple of other regional parks with similar resources. The proposed paved multi-use trail, environmental interpretation and freshwater bank fishing will provide unique opportunities in the environmentally restored project area. The proposed recreation resources will help to provide facilities for current statewide and Region XI deficits.

∗ The proposed C-9 Environmental Restoration Project recreation facilities carrying capacity point values are estimated to improve with the recreation component construction. The general recreation values are based on the optimum use of the site potential, without overuse of the proposed recreation resources. Above average water resources and access to them for freshwater bank fishing, interpretation and bird watching comprise a large part of the projected recreation resources use. The recreation area will provide adequate water access for freshwater bank fishing. Peak use is conservatively projected to occur during half of the calendar year.

∗ The accessibility rating is based upon the availability of local highways, roads and streets in good condition that will provide access to the proposed recreation facilitates. Direct routes from the north and south (NW 37th Ave, NW 27th Ave, Florida Turnpike) provide plenty of citywide access. Neighborhood streets that dead-end into the C-9 ROW will provide pedestrian access needs.

∗ The environmental quality rating is based upon the existing aesthetic values of the proposed C-9 recreation facilities and the ease of correcting any limiting aesthetic factors. The proposed site possesses average aesthetic resources given that the area is heavily urbanized. The best aesthetic of the proposed project area are of the C-9 Canal which is a wide water body that is relaxing to view. The existing environmental quality of the site will be improved by the Section 1135 Restoration Project before the recreation component has been completed. The habitat restoration materials would help to ameliorate the hot summer sun conditions within the recreation area. Thus the increase in point values within the same judgment column as appears in the ER 1105-2-100, Table 1 (http://www.usace.army.mil/inet/functions/cw/cecwp/cecwp_temp/guidance.htm).

Using the guidelines for Assigning Points for the General Recreation in Table 1, the value of a day of general recreation at the proposed C-9, Section 1135 Environmental Restoration

Project, recreation facilities, was determined for each project activity. The points were then converted to dollar values using conversion factors included in the Economic Guidance Memorandum 01-01, Unit Day Values for Recreation, Fiscal Year 2001, which is based on ER 1105-2-100, Table 1.

TABLE 2. USER PARTICIPATION

DESIGN DAY CAPACITY METHOD

ACTIVITY	# OF UNITS	DAILY TURNOVER RATE	INSTANTANEOUS CAPACITY/UNIT	DESIGN DAY LOAD
Multi-Use Trail	4 miles	3	50/mi	600
Bird watching	9.5 acres	-----	46	437
Sightseeing	46 Benches	-----	3.5	161
Bank Fishing	4 miles	1.5	45	270
Interpretive Features	8 signs	6	2.5	120
Bicycling	4 miles	-----	50	50
TOTAL				1,638

1,638 / 1.5* = 1,092 (TOTAL USER DAYS/DESIGN DAY) WITH the PROJECT
* Denotes adjustment for multiple use
(Multiple use is visitor use of more than one facility per visit)
# Denotes general recreation without the project (see Table 3)

TABLE 3

RECREATION VALUE WITHOUT PROJECT

ACTIVITY	ANNUAL USER DAYS	UNIT DAY VALUE	ANNUAL ACTIVITY VALUE
General Recreation	143,413	$3.94	$565,047
Total recreation Value Without Project (rounded)			$565,000

The annual user days were calculated with the point values for the "without project" in Table 1 and a portion of the design day load in Table 2. This portion represents the value assigned to the "without project condition" for the activities designated by the # symbol in Table 2.

(#431) (104) / 0.6 / 0.5 = 149,413 Annual User Days (without the project)
(104) equals the weekend days in a year
0.6 is the proportion of peak use expected on weekend days
0.5 is the proportion of annual use expected during this time
# Denotes total general recreation without the project design day load value

TABLE 4
RECREATION BENEFITS

ACTIVITY	ANNUAL USER DAYS	UNIT DAY VALUE	ANNUAL ACTIVITY VALUE
General Recreation			
Total With Project Value*	378,560	$5.93	$2,244,800
Less Recreation Value: (Without Project)	149,413	$3.96	$565,000
Annual Recreation Benefits With Project (rounded)			$1,679,800

(1,092) (104) / 0.6 / 0.5 = 378,560 Annual User Days (with the project)
(104) equals the weekend days in a year
0.6 is the proportion of peak use expected on weekend days
0.5 is the proportion of annual use expected during this time

Methodology for arriving at ANNUAL USER DAYS: 1,092 TOTAL USER DAY from Table 2 is then multiplied by the number of weekend days and holidays that occur during the Peak Use Period (35 days). The result is divided by the proportion of the Peak Use Period expected on weekend days (0.6). The figure is then divided by the proportion of annual use (0.5) expected during the Peak Use Period. This figure is the ANNUAL USER DAYS for the General Recreation Total With Project Benefits.

Table 4 estimates recreation facility visitation and activity values with the General Recreation Total With Project Benefits of 378,560 (ANNUAL USER DAYS) minus the Less Recreation Value (Without Project) of 149,413 (ANNUAL USER DAYS), which equals the C-9 recreation area facility demand of 229,147 occasions/ demand annually. The annual user day figures can be translated into park visitation on an annual basis. These figures do not include tourist use or any other visitor use occasions/demands from outside Miami-Dade County. The estimate represents a conservative number that could prove to be greater or less in the future.

2.2 Incremental Analysis

Incremental cost analysis is the comparison of additional project segment costs based on a standard unit of measurement that accurately reflects conditions and changes at those levels. For every unit of change (output) a unit of cost is derived based on a progressive step-by-step comparison. In this manner cost effective alternative plans are compared to alternative plans to see which alternative is most cost effective. When additional costs (incremental cost) for additional amounts of output are compared the results of the comparisons will determine the 'best buy' alternative. It is then asked 'Is it worth it?' When that question can be answered the optimal alternative that is the most cost effective plan will have been determined.

Recreation resource deficits are noted in the 2000 Draft Statewide Comprehensive Outdoor Recreation Plan (SCORP) for the project area Region XI and include; nature study, bicycle riding facilities, and freshwater fishing opportunities. The SCORP also notes that deficits in these resources are projected to increase over time. The objective of the proposed ancillary recreation component of the C-9 restoration project is to provide complimentary recreation resources that will, 1) blend with the restoration project, 2) take advantage of the interpretive opportunity, 3) utilize the restored environment. The proposed addition of a recreation component has not influenced the environmental restoration project goals, objectives or plan but will take advantage of the restoration element to provide interpretive and multi-use recreation resources. The recreation plan has been broken down into geographical segments based on project limits and intersecting roadways (see Project Study Area map).

A nature trail is proposed to undulate within the C-9 rights-of-way (ROW) and provide access to the littoral shelves for bird watching, bank fishing and environmental education. Benches and interpretive signage are proposed for bird watching and environmental education.

TABLE 5 RECREATION DECISION MATRIX

ALTERNATIVE	BENEFITS	**COST	OUTPUT	SEGMENT OUTPUT RANK
NO. 1 (SW, SE Segments)	Bridge needed to provide good trail connectivity – shortest total length	3rd Highest Cost ($372,405)	Lowest Output (10,500 LF trail, 6 signs, 26 benches)	EXPENSIVE FOR OUTPUTS
NO. 2 (NW, SW, SE Segments)	Second best connected loop trail option (bridge needed)	2nd Highest Cost ($435,955)	3rd highest output (15,500 LF trail, 9 signs 37 benches)	BRIDGE INFLATES ALTERNATIVE COST
NO. 3 (NW, NE, SE Segments)	**Most fragmented trail proposed – no connectivity for a total trail length**	Lowest Cost ($205,970)	2nd highest output (16,000 LF trail, 9 signs, 38 benches)	CHEAPEST ALTERNATIVE
NO. 4 (NW, SW, NE, SE Segments)	Greatest quantity of connected trail interpretive signage & benches	Highest Cost ($506,310)	Highest Output (21,000 LF of trail, 12 signs, 50 benches)	MOST BENEFITS

****** Costs are estimates (for comparison only) subject to change – Chart does not measure connectivity of increments for a more holistic proposal only trail length.

The North West (NW) segment is approximately 5,000 linear feet (LF) adjacent to a residential subdivision with a school. This segment proposes 5,000 LF of trail ($53,050) [*1 trailhead ($3,500), bollards with cable ($2,250), security lighting ($1,800), 3 interpretive signs ($2,250), 12 benches ($9,000) for a total of $71,850*]. The trailhead would provide a space to park a few cars and access the trail. The NW segment tangible and intangible benefits would far exceed the tangible and intangible costs, however limited, due to trail length. Nature study, education and bird watching would be directly available to all Carol City residents and would help unify the neighborhoods. This segment would be easiest to construct with centralized Canal 9 access centrally located via NW 32nd Avenue.

The South West (SW) segment is approximately 5,000 LF and is adjacent to a subdivision across C-9 from the NW. This segment proposes 5,000 LF of trail ($53,050), 1 canal crossover ($237,220) [*1 trailhead ($3,500), bollards with cable ($2,250), security lighting ($1,800), 3 interpretive signs ($2,250), 12 benches ($9,000) for a total of $309,070. The trailhead would provide a space to park a few cars and access the trail*]. This segment would require pedestrian access to span a drainage canal that intersects with C-9. The SW segment tangible and intangible benefits are greater than other segment costs but would add to the project's overall benefits, however limited, due to trail length. The addition of this segment would provide the southwest leg of a loop from the NW. NW 37th Avenue and NW 27th Avenue would have to be crossed to complete the loop (approximately 10, 750 LF or 2 miles in length).

The North East (NE) segment is approximately 5,500 LF and is adjacent to a subdivision across C-9 from the SE. This segment proposes 5,500 LF of trail ($58,355), [*1 trailhead ($3,500), bollards with cable ($2,250), security lighting ($1,800), 3 interpretive signs ($2,250), 13 benches ($9,750) for a total of $77,905*]. The NE segment would require a substantial canal crossing and ramp to NW 27th Avenue but it is known if this could be permitted by FDOT. The trailhead would provide a space to park a few cars and access the trail. The NES would be the most expensive segment of the four proposed and would tie the divided communities together to form a loop with the rest of the segments. It is hoped the tangible and intangible benefits would exceed the tangible and intangible costs.

The South East (SE) segment is approximately 5,500 LF and adjacent to Pro Player Stadium. This segment proposes 5,500 LF of trail ($58,355) [*1 trailhead ($3,500), bollards with cable ($2,250), security lighting ($1,800), 3 interpretive signs ($2,250), 13 benches ($9,750) for a total of $77,905. The trailhead would provide a space to park a few cars and access the trail*]. The SE segment tangible and intangible benefits would exceed the tangible and intangible costs, and provide additional resources in the most cost-effective segment. The addition of the SE would be very cost effective as no additional structures or crossings are required. The SE would provide 16, 050 LF of total trail.

The segments total approximately 21,000 LF or almost 4 miles with a total cost of approximately $565,230 or a cost of $141,307 per mile of greenway with the bridge and $82,003 per mile without the bridge. The proposed greenway segments offer a very similar educational/interpretive experiences but as a whole offer increased and diverse resource opportunities for more local users, possibly citywide, to learn about the environment and help to reduce SCORP projected recreation resource deficits. It is recommended that the entire trail be constructed to provide the best overall public benefit. Low maintenance amenities that provide access, safety and educational opportunities should be constructed to fit within the cap. This would supply the most resource deficits at the greatest cost.

TABLE 6 RECREATION ALTERNATIVE EVALUATION MATRIX

Incremental Value Comparisons

Alternatives / Objectives	**NO ACTION PLAN**	**ALT NO. 1** (SW, SE Segments)	**ALT NO. 2** (NW, SW, SE Segments)	**ALT NO. 3** (NW, NE, SE Segments)	**ALT NO. 4** (NW, SW, NE, SE Segments)
SHORELINE FISHING	WORST Least fishing habitat	FAIR 7,100 LF of littoral zone habitat proposed.	GOOD 10,500 LF of littoral zone habitat proposed.	GOOD 10,800 LF of littoral zone habitat proposed.	BEST 14,200 LF of littoral zone habitat proposed.
INTERPRETIVE OPPORTUNITY	WORST None	OKAY 10,500 LF of nature trail, 6 interpretive signs, 25 benches.	GOOD 15,500 LF of trail, 9 interpretive signs, 37 benches.	GOOD 16,000 LF of nature trail, 9 interpretive signs, 38 benches.	BEST 21,000 LF nature trail, 50 Interpretive Signs, 50 benches.
NEIGHBORHOOD ACCESS PROXIMITY & CONTINUITY	WORST None provided by Federal project.	FAIR Fair neighborhood access & proximity. Bridge needed to span canal west of NW 27th Ave for trail continuity.	OKAY Good neighborhood access & proximity. Bridge needed to span canal west of NW 27th Ave for trail continuity.	OKAY Good neighbor-hood access & proximity. No trail continuity or connectivity.	BEST Best neighborhood access, proximity & connectivity. Connects to future greenways planned for C-9.
SCORP VALUE and COSTS	WORST None	POOR Provides lowest resource base with. high cost (bridge).	GOOD Provides 3rd best resource base with high cost (bridge).	FAIR Provides 2nd best resource base. Poor overall trail connectivity.	VERY GOOD Provides best resource base with high cost (bridge).
OVERALL RECREATION ALTERNATIVE VALUE	WORST None	POOR INCREMENT VALUE	FAIR INCREMENT VALUE	SLIGHTLY BETTER INCREMENT VALUE	BEST INCREMENT VALUE

SCORP* - Statewide Comprehensive Outdoor Recreation Plan, State of Florida, 2000

The northwest (NW), northeast (NE), southwest (SW) and southeast (SE) segments are project geographical designations for the purposes of identification and incremental analysis. The above table provides a comparison of the proposed recreation increments to planning objectives.

TABLE 7 - TRAIL MATERIAL COMPARISON

SURFACE MATERIAL	EXPECTED LIFE-SPAN	MAINT. COSTS - RATE	ADA COMPILANT	DRAINAGE CHARACTER	USE - COMFORT	INITIAL COSTS	MULTI-USE FUNCTION
CONCRETE	LONGEST	LEAST - lowest	YES	GOOD	LOW	$13 - $15	GOOD
#ASPHALT	2nd BEST	2ND BEST – (reseal every 7 yrs)	YES	GOOD	GOOD	$7 - $9	BEST
CRUSHED SHELL	GOOD	GOOD – minimal annual	YES	GOOD	GOOD	$6 - $8	AVERAGE (no rollerblades, skateboards)
MULCH	POOR	HIGH – after each rain	NO	POOR	GOOD	$5 - $7	POOR
SOIL STABILIZER	GOOD	FAIR – after each rain	YES (WHEN DRY)	FAIR	FAIR	$15 - $20	GOOD (except after rain.)
URETHANE RUBBER	FAIR	GOOD – minimal annual	YES	GOOD	BEST	$15 - $20	AVERAGE (poor for bikes, etc.)

OMRR&R – Operation, maintenance, repair, rehabilitation and replacement
ADA – Americans with Disability Act, Title III regulations (28 CFR Part 36, revised July 1, 1994)
***** - assuming no trail damage by canal maintenance equipment
Costs are based on linear footage for comparative use only – range provided to include unknown site-specific situations (RSMeans, 2001, Site Work & Landscape Cost Data)
#Asphalt – Number one recommended surface of bike trails (Park Planning Guidelines, 3rd Ed., Fogg, 1981)

The C-9 Section 1135 Study multi-purpose trail complies with guidance found in the Policy Guidance Letter No. 59, 11 June 1998, the Planning Guidance Notebook, ER 1105-2-100, April 2000 and ER 1165-2-502, 30 Sep 1999. The proposed trail will provide multiple uses that include environmental interpretation, exercise and an alternative intermodal surface transportation route away from motorized vehicles. The project area is the essentially flat C-9 right-of-way that could periodically flood. The subsurface varies from sandy to rocky to organic soils. The site is currently grassed and abuts residential housing with links to public parks and Joe Robbie Stadium.

Trail surfacing preference input was garnered from public meeting (July & August 2001) comments. Corps of Engineers Cost Estimation Branch developed construction costs that helped determine cost-effectiveness of trail surfacing materials. Telephone calls to national, state and local parks were conducted to determine what surfacing material worked best given the visitor volume, trail dimensions, existing soils and climate at the specific parks. The Florida Department of Transportation and the Miami-Dade County Planning Departments were also contacted. The proposed bituminous asphalt trail will provide the lowest installation and OMRR&R cost. It will also provide the best multi-use options. It will not be wide enough to be a wildlife barrier as remotely suggested in the USFWS, Coordination Act Report, December 12, 2001.
CESAJ-PD-ES 29 October 2001

MEMORANDUM FOR THE RECORD

SUBJECT: Footbridge Manufacturer Meeting

1. Mr. Paul Stevenson, PD-ES, met with Mr. Charles Grinstead, representing Hunter Knepshield and Acrow Pedestrian Bridge Series. Paul discussed a couple studies he is involved with where footbridges are being considered. Paul told Mr. Grinstead that he was collecting information about pedestrian bridge options and costs and that the conversation was simply a fact-finding endeavor. Mr. Grinstead said he understood and would provide what information he could.

2. A design concept for C-9 with dimensions was discussed and Paul requested a general cost estimate for the 100-foot long by 8-foot wide austere Pratt Truss Pedestrian Footbridge. The bridge design load is 85 PSF, bridge weight is 32,743 pounds to be shipped in two pieces to the project site. No welding required. A price of $63,686 was provided. The bridge price quote is valid until January 31, 2002.

3. This price was given to the team cost estimator. The cost estimator provided a final bridge cost (which included the prefab bridge, bridge assembly, bridge abutments and abutment dewatering with a 25% contingency) for a total estimated cost of approximately $237,220.

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Paul C. Stevenson, RLA, ASLA
Environmental Protection Specialist

REFERENCES

Flood Control Act of 1944, Section 4 (Public Law 738).

Federal Water Project Recreation Act of 1965 (Public Law 89-72).

Land and Water Conservation Fund Act of 1965 (Public Law 88-578).

Federal Water Project Recreation Act of 1992 (Public Law 102-575).

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Marth & Marth (1997), Florida Almanac 1997-1998, Pelican Publishing, Gretna, Louisiana,

U. S. Army Corps of Engineers (USACE), CECW-AG (Jun 1998), Policy "Guidance Letter No. 59, Recreation Development in Ecosystem Restoration Projects", Washington, D.C.

USACE, (Apr 2000), "Planning Guidance Notebook"; ER 1105-2-100, Department of the Army, Washington, D.C.

USACE, (Nov 1996), Planning Manual, IWR Report 96-R-21, Alexandria, VA

USACE, (Oct 1994), Cost Effectiveness Analysis for Environmental Planning: Nine Easy Steps, IWR Report 94-PS-2, Alexandria, VA.

USACE, (Dec 1996), Bussey Lake: Demonstration Study of Incremental Analysis in Environmental Planning, IWR Report 93-R-16, Alexandria, VA.

USACE, (Jan 1995), Munyon Island, Section 1135, Environmental Restoration, Draft Project Modification Report and Environmental Assessment, Jacksonville District, Jacksonville, FL.

USACE, (Apr 1999), Central and Southern Florida Project Comprehensive
3 Review Study, Integrated Feasibility Report and Programmatic Environmental Impact Statement, Volume 1, Jacksonville District, Jacksonville, FL.

USACE, (Mar 2000), Peanut Island, Section 1135 Environmental Restoration, Final Environmental Restoration Report and Final Environmental Assessment, Jacksonville District, Jacksonville, FL.

APPENDIX IX

SECTION 404 (b) 1 EVALUATION REPORT

CANAL 9 SECTION 1135 ENVIRONMENTAL RESTORATION PROJECT
MIAMI-DADE COUNTY, FLORIDA

I. Project Description.

a. Location. The Snake Creek Canal (C-9), Section 1135 Environmental Restoration project is located in the Carol City area of North Miami-Dade County, Florida, Sections 33, 34, 35 Township 51 South, Range 41 East (Figure 1). The C-9 project area includes the north and south side Rights-of-Way (ROW) lands of the canal from NW 37th Avenue to the Florida Turnpike. C-9 flows into the Oleta River via Structure 29 and then empties into the Biscayne Bay, an Outstanding Florida Water (OFW).

b. General Description. The purpose of this project is to restore wetland and associated upland habitat in the C-9 ROW to provide habitat for fisheries and wildlife in the region and remove existing invasive exotic plant species and their seed sources. The proposed environmental restoration project would excavate 300-foot long by 10 to 30-foot wide littoral shelves from the C-9 side banks. Native, heterogeneous plant materials would be installed in the excavated littoral shelves and the adjacent upland buffer area. An ancillary recreation component (paved trail, seating, austere footbridge and interpretive signage) is also proposed. No dredging or filling of wetlands would occur. One foot of suitable material would be placed on the excavated shelves to provide suitable substrate for plants. Excavated material would be placed in the C-9 ROW lands and covered by native plant materials.

c. Authority and Purpose. The C-9 project was authorized by the Flood Control Act of 1944 and by Section 1135 of the Water Resources Development Act of 1986, as amended. The purpose of the Section 1135 is to determine the need for modifications to existing water resources projects that would improve the quality of the environment in the public interest.

d. General Description of Dredged or Fill Material. There is no dredged or wetland fill material proposed with the construction of restoration project. The plan calls for littoral shelves to be excavated from uplands that would be inundated by C-9 waters. Approximately 65,000 CY of excavated material would be placed in the C-9 ROWs. Approximately 9 acres of uplands would be excavated and planted as littoral shelves for Alternatives 5 and 5a. Approximately 47,000 CY would be excavated for Alternatives 6 and 6a. This excavation and placement of the material in the C-9 ROW would not result in any long-term increase in turbidity or violation of State of Florida water quality standards.

e. Description of the Proposed Discharge Site. There is no discharge site associated with the C-9 restoration project. The excavation would probably be completed by a tracked, long-armed backhoe and the material would be placed in the C-9 ROW and planted with native plant materials. All recognized Best Management Practices (BMPs), i.e.; turbidity control measures, fuel containment measures, etc., applicable to project construction would be considered to ensure compliance with water quality certificate parameters before construction begins. Standard turbidity controls (i.e. turbidity curtains, hay bales, etc) would be utilized during the project construction.

II. Factual Determinations.

a. Water Circulation, Fluctuation and Salinity Determination. C-9 is a flood control canal whose water levels are regulated by Structure 29 near US Highway 1. Structure 29 is designed to prevent saltwater intrusion into the canal and help regulate the C-9 water levels based on storm discharges in the C-9 basin. Water circulation is mainly wind driven. Gravity-induced flow from C-9 empties into Biscayne Bay. Water control structure S-29 regulates canal discharges and prevents salinity seepage. The proposed project area is a freshwater system.

b. Suspended Particulate/Turbidity Determinations. A temporary short-term increase in suspended particulates could occur in the canal waters during project construction. Once the project excavation has been completed no adverse increase in turbidity is anticipated. Once the excavation has been completed benthic organism movements should return to existing conditions. Other benthic organisms may be recruited and water quality in the project specific area may improve.

c. Contaminant Determinations. No toxic materials are a part of the upland materials to be removed from the canal edge of C-9. Excavated soils would be placed in the canal ROW lands or disposed of in an environmentally friendly manner. BMPs would be implemented by the contractor to prevent high levels of turbidity in the water column during project construction. Standard turbidity controls would be utilized during project construction.

d. Aquatic Ecosystem and Organism Determinations. No long-term adverse impacts on autotropic and heterotrophic organisms are anticipated. No adverse impacts on motile invertebrates are anticipated. No adverse impacts are expected on nekton organisms as these creatures are generally not found in the project area.

e. Proposed Placement Site Determinations. The proposed placement of the material excavated from the C-9 side banks is anticipated to be in the canal ROWs. There are no anticipated adverse impacts to the water quality in the C-9 canal. The excavation littoral shelves into the side banks of the C-9 canal upland and the planting of native, heterogeneous plant material could improve water quality in the project specific area and would provide wildlife habitat.

f. Determination of Cumulative Effects on the Aquatic Ecosystem. The proposed project would not cause or contribute to violations of State Water Quality Standards, jeopardize the existence of any endangered or threatened species (manatee, wood stork, eastern indigo snake) or impacts Outstanding Florida Waters. No water quality degradation is expected and all appropriate and practicable steps would be taken to minimize impacts. Improvements to upland and wetland habitats are anticipated with the project construction.

III. Findings of Compliance or Non-Compliance with the Restrictions on Discharge.

1. No relevant adaptations of the Section 404 (b) guidelines were made relative to this evaluation.

2. There would be no discharge of toxic or other fill material to local water in the project area. Therefore, the project complies with Section 307 of the Clean Water Act.

3. There would be no adverse impacts on the water supply of surrounding communities in the Carol City area from the implementation of this project.

4. There would be no direct or indirect adverse impacts on any threatened or endangered organism from the implementation of this project.

5. There would be no relevant long-term adverse impacts on any autotrophic organisms from the implementation of the selected plan.

6. There would be no direct or indirect adverse impacts on highly motile organisms such as fish and invertebrates.

7. No long-term relevant direct or indirect adverse impacts are anticipated on non-motile infaunal organisms or motile epifaunal organisms in the immediate project area from the proposed project construction or maintenance.

8. No relevant adverse impacts are anticipated on terrestrial wildlife in the immediate project area.

9. Implementation of the project would pose no threat to juvenile fish or wildlife dependent upon the immediate project area for their subsistence.

10. No relevant or long-term adverse changes in the biodiversity of the communities are anticipated due to the project construction.

11. On the basis of the guidelines, the preferred disposal alternative for the placement of the excavated material is specified as complying with the requirements of the Clean Water Act.

APPENDIX X

SUMMARY OF COMPLIANCE
WITH
ENVIRONMENTAL LAWS AND REGULATIONS

1. National Environmental Policy Act of 1969, as amended. Environmental information on the project has been compiled and the draft Environmental Restoration Report and Environmental Assessment was made available for public review. This public coordination and environmental impact assessment complies with the intent of NEPA, CEQ Guidelines and the Corps ER 200-2-2. The proposed action is not expected to significantly affect the quality of the human environment. If this judgment is confirmed through the public review process, the District Commander will sign Findings of No Significant Impact concluding that an EIS is not required. Full compliance with NEPA be have been achieved once the District Commander has signed the FONSI.

2. Endangered Species Act of 1973, as amended. Consultation with the U.S. Fish and Wildlife Service was initiated in February 2001 for the purposes of Section 7 Coordination. By letter dated October 16, 2001, the USFWS determined that there would be no impacts any listed endangered species.

This project was fully coordinated under the Endangered Species Act; therefore, this project is in full compliance with the Act.

3. Fish and Wildlife Coordination Act of 1958, as amended. The project has been coordinated with the USFWS. It has prepared a Coordination Act Report for the project. Therefore, the project is in compliance with the Act.

4. National Historic Preservation Act of 1966, as amended (PL 89-665). We have coordinated our no effect determination with the Florida State Historic Preservation Officer (SHPO). The SHPO concurred with the determination that significant historic properties would not be effected by the proposed construction. Therefore, the project is in compliance with this Act and with the Archeological and Historic Preservation Act, as amended (PL 93-291).

5. Clean Water Act of 1972, as amended. This project would involve the discharge of material into any wetlands or other waters of the United States. Therefore, in order to be in full compliance with this Act, a Section 404 (b) 1 Evaluation has been prepared and is contained in Appendix IX.

6. Clean Air Act of 1972, as amended. No air quality permits would be required for this project. Therefore, this Act would not be applicable.

7. Coastal Zone Management Act of 1972, as amended. The project has been evaluated in accordance with Section 307 of the Coastal Zone Management Act. It has been determined that the project would have no unacceptable impacts and would be consistent with the Florida Coastal Zone Management Plan.

8. Farmland Protection Policy Act of 1981. No prime or unique farmland would be impacted by implementation of this project. This act is not applicable.

9. Wild and Scenic River Act of 1968, as amended. No designated Wild and Scenic river reaches would be affected by project related activities. This act is not applicable.

10. Marine Mammal Protection Act of 1972, as amended. Incorporation of the safe guards used to protect manatees during excavation and disposal operations would be implemented during construction, therefore, this project is in compliance with the Act.

11. Estuary Protection Act of 1968. No estuary would not be adversely affected by project activities, there the proposed project is in compliance with the Act.

12. Federal Water Project Recreation Act, as amended. There is no recreational development proposed for maintenance dredging or disposal. Therefore, this Act does not apply.

13. Resource Conservation and Recovery Act of 1976, (PL 94-580; 7 U.S.C. 100, et seq. This law has been determined not to apply, as there are no items regulated under this act being disposed of or affected by this project.

14. Toxic Substances Control Act of 1976, (PL 94-469; U.S.C. 2601, et seq. This law has been determined not to apply, as there are no items regulated under this act being disposed of or affected by this project.

15. E.O. 11990, Protection of Wetlands. No wetlands would be adversely affected by project activities. There would be a net gain to wetlands as a result of this project. This project is in compliance with the goals of this Executive Order.

16. E.O. 11988, Floodplain Management. No activities associated with this project would take place in a floodplain; therefore the project is in compliance with the goals of this Executive Order.

17. E.O. 12898, Environmental Justice. The proposed action would not result in any adverse human health or environmental effects on a minority or disadvantaged community. This project will afford healthy outdoor recreation opportunities to such communities, therefore it is in compliance with the spirit and intent of this Executive Order.

18. E.O. 13112, Invasive Species. The proposed action does not plan to plant any non-native material to provide wildlife habitat or improve water quality. Proposed planting materials are to be native and heterogeneous, spaced to crowd out exotic invasive plant materials. The proposed project is in compliance with the goals of this Executive Order.

19. Coastal Barrier Resources Act, PL 101-591. The proposed work is not in any Coastal Barrier as prepared by the Department of Interior in the Report to Congress on the Coastal Barrier Resources System. In accordance with 43 CFR Subtitle A, Section II. Exceptions and Consultation, Subsection Exceptions (2) Channel Improvements (Section 6(a)(2)), the maintenance dredging and disposal are exempted from the Act.

20. Magnuson-Stevens Fishery Conservation and Management Act. This act requires that Essential Fish Habitat (EFH) be considered when undertaking any dredging project. The proposed action would not have an adverse impact on EFH or Federally managed fisheries. Our final determination relative to project impacts and the need for mitigation measures is subject to review by and coordination with the National Marine Fisheries Service.

21. SUBMERGED LANDS ACT of 1953. The proposed environmental restoration project will not affect submerged State lands. The disposal of the excavated material from the Environmental Restoration project will be disposed of offsite most likely in a local landfill or spread over the ROW. The local sponsor will acquire the necessary real estate easements for this work. The Corps will apply for a water quality certificate to undertake the work.

22. RIVERS and HARBORS ACT of 1899. The proposed work would not obstruct navigable waters of the United States. The proposed project is in full compliance.

23. ANADROMOUS FISH CONSERVATION ACT. Anadromous fish species would not be affected. The project has been coordinated with the National Marine Fisheries Service and is subject to review and comment by the National Marine Fisheries Service.

24. MIGRATORY BIRD TREATY ACT and MIGRATORY BIRD CONSERVATION ACT. No migratory birds would be adversely affected by the proposed project activities. Migratory birds will benefit from this ecosystem restoration project. The project is in full compliance with these acts.

25. MARINE PROTECTION, RESEARCH and SANCTUARIES ACT. The term 'dumping' as defined in act (33 U.S.C. 1402(f)) does not apply to the placement of the disposal of the excavated material from the environmental restoration project. The excavated material will most likely be placed in a local landfill or spread over the ROW. Therefore, the Act does not apply to the proposed project. The disposal activities addressed in this EA will be evaluated under Section 404 of the Clean Water Act.

APPENDIX XI

THREATENED AND ENDANGERED SPECIES BIOLOGICAL ASSESSMENT

CANAL 8 & CANAL 9 SECTION 1135
ENVIRONMENTAL RESTORATION PROJECT

1. PROJECT AUTHORITY:

Initial Authorization. The Biscayne Canal (C-8) and Snake Creek Canal (C-9) Flood Control Projects were first authorized by Congress as components of the Central and Southern Florida (C&SF) Project by the Flood Control Act of June 30, 1948 (P.L. 10-858). The authorization provided for nine different project purposes. The C-8 and C-9 project construction provided flood control canals to facilitate the drainage of approximately 98 square miles and salinity intrusion barriers S-28 and S-29. S-30 was constructed to west of project lands on C-9 where the canal intersects with Levee 18.

Supplemental Appropriation. The Energy and Water Development Act of 1995 (Approved August 26, 1994; 108 Stat. 1707; 17 pages), H.R. 4603/Public Law 103-316 provided the authorization to begin the study of design and construction improvements to Canal 7, Canal 8 and Canal 9 for flood control improvements and environmental protection/ restoration. Section 1135 of the Water Resources Development Act of 1986, as amended, provides the U. S. Army Corps of Engineers (Corps) the authority to make modifications in the structures and operations of water resources projects, constructed by the Corps, to improve the quality of the environment in the public interest. The primary benefits must be associated with the improvements to fish and wildlife.

2. LOCATION:

Project lands are located in the State of Florida, northern Miami-Dade County, Township 51 and 52 South, Range 41 East, Section 33, 34, 15, 16 in existing urban developed areas with marginal to poor existing species habitat. Because the C-8 and C-9 Restoration Projects occupy similar land use covers in Miami-Dade County, both proposed projects are treated as one for the purposes of formulating this biological assessment. Adjacent to the proposed project, properties include neighborhood roads, collector roads, arteries and thoroughfares, public schools, public parks, housing, commercial and industrial lands. Overhead and underground utilities are adjacent and within the proposed project rights-of-way (ROW). Animals found within the C-8 and C-9 ROW includes waterfowl and wading birds, reptiles, amphibians and mammals.

A. The proposed C-8 (Biscayne Canal) environmental restoration project is located in the North Miami and Opa Locka areas of the County. The proposed project lands include approximately 7,000 linear feet of canal ROW from NW 27th Avenue to just east of Interstate 95. The ROW width varies from 110 to 120 feet, from fence line across the canal to the opposite fence line. The C-8 canal water width varies from 50 to 60 feet leaving approximately 30 feet of land within the proposed project area from waters edge to edge of ROW. Residential lands have been developed right up to the waters' edge in some locations.

B. The proposed C-9 (Snake Creek) environmental restoration project is located in North Miami area adjacent to Joe Robbie Stadium. The project lands include approximately 9,400 linear feet canal ROW from NW 37th Avenue to just eastward of the Florida Turnpike. ROWs vary in width from 335 to 365 feet wide. Actual water surface width range from 90 to 100 feet leaving approximately 110 to 135 feet of land on either side of the canal within the proposed project lands. The ROW lands are fenced which keep residential encroachments out of the ROWs.

3. DESCRIPTION OF PROPOSED ACTION:

The objectives of the C-8 and C-9 canal, Section 1135 environmental restoration projects are to create ecological enhancement with the construction of littoral areas within existing flood control canals and provide ancillary recreation opportunities within the canal ROWs. It is anticipated the projects will promote an increase in the biological diversity and productivity of the canals, which could provide additional ecological and recreational resources and enhance the fish populations. The construction and local sponsor management of the proposed project could help to contribute to South Florida Ecosystem Restoration Initiative objectives. The projects propose to restore environmental habitat with the excavation and planting of littoral shelves into the existing canal side banks. The excavated littoral shelves will provide increased and improved foraging habitat by expanding prey base species opportunities. The project is not expected to have a significant effect on wood storks, eastern indigo snake, or the West Indian manatee.

The work will be undertaken from the canal ROW lands probably with a long-armed, tracked excavator. The excavated material would be removed from the canal side bank and dumped into a dump truck. The excavated material, if determined appropriate, will be disposed of within the canal ROW. If not appropriate the excavated material will be disposed of in an environmentally friendly manner. Access to each site is currently available. Some minor tree trimming may be necessary to access the C-8 ROW in the areas between NW 22nd Avenue and the Miami Canal on the north bank.

Turbidity barriers will be used and manatee construction precautions will be implemented. Construction considerations for the eastern indigo snake and wood stork will also be implemented. Once the slightly sloped littoral shelves are excavated they will be planted with native submerged, emergent, inter-tidal, upper-tidal and land based vegetation where appropriate. A shrub/tree zone is proposed for C-9. The side slopes of C-8 are too steep and narrow for this element. Native, low-maintenance plants are proposed.

An ancillary recreation component is being studied to determine its feasibility and compatibility with the proposed environmental restoration project. A paved multi-purpose trail for walking, bicycle riding, jogging and environmental interpretation is currently proposed for C-8 and C-9. The cost effectiveness of a bituminous verses rubber binder surfaced trail is being analyzed and will be determined before plans and specifications are completed. Other recreation support amenities (benches, vehicular parking areas, upland plantings, directional safety lighting and water fountains) are being analyzed for the environmental restoration compatibility and as local sponsor options.

The authorized C-8 and C-9 project purpose of flood control would not be affected by the proposed environmental restoration projects. Water regulation schedules and stormwater conveyance would not be affected. Intermediate trophic level aquatic species, which occupy critical links in the food web of the greater Everglades, have been greatly reduced due to loss of habitat and adverse hydrological changes. The proposed restoration projects could help to provide environmental habitat for these species once the project has been constructed and plant material established. A proposed project Fish and Wildlife Coordination Act Report, dated September 2001, has been completed and is being coordinated at this time.

4. LISTED SPECIES THAT MAY BE AFFECTED:

Listed species that may occur in the vicinity of the project area include the endangered wood stork (*Mycteria americana*), threatened eastern indigo snake (*Drymarchon corais couperi*) and the endangered West Indian manatee (*Trichechus manatas*).

Less than 10,000 wood storks inhabit peninsular Florida at present (Hendry, Goodwin, Labinsky 1982) due to the rapid drainage of wetlands throughout the State and the reduced availability of food. A small number of storks are lost to shootings each year also. Populations of wood storks in Central America and Mexico are unknown at this time. Wood storks general breeding range includes Florida, Georgia and South Carolina. They have been seen over most of the US and small parts of Canada. It is believed that wood storks respond to changing environmental conditions through temporal relocation. Wood storks utilize a special tactile foraging method called grope feeding where prey is dislodged with its feet and located with its 6-9 inch bill. Storks forage in a wide variety of shallow freshwater systems (FWS 1997) generally based on prey densities and water depth (Ogden *et al*. 1978, Browder 1984, Coulter 1987).

The production of wood stork colonies varies considerably between years and locations, apparently in response to food availability (Ogden, 1996a). Several valuable nesting colonies have been found within the Everglades National Park, Corkscrew Swamp Sanctuary and the Pelican and Merritt Island National Wildlife Refuges. There has been an increase in nesting populations of wood storks in the South Florida area between 1991 and 1995. Since the 1970s wood storks have been seen utilizing artificial impoundments or islands created by dredging as nesting habitat (Ogden 1991), suggesting buffer zones may be necessary to reduce human disturbances of storks when feeding and nesting (FWS, 1999). Wood storks nesting periods in south Florida varies geographically, but they generally begin laying eggs between October and June (Rodgers 1990). It is likely that wood storks may utilize these canals within the project area for foraging. However, no nesting colonies have been found within the project area. Critical habitat is not currently designated for the wood stork at this time.

The threatened eastern indigo snake is the largest snake in Florida. This non-venomous, non-constricting snake's range is most of the State of Florida. It hunts during the cooler daylight hours for a wide range of reptiles, birds and mammals that it can overpower and eat. (Hendry, Goodwin, Labinsky 1982). Eastern indigo snakes have been found in gopher tortoise, rodent and armadillo burrows, hollowed logs, root channels and crab burrows (Lawler, 1977, Moler 1985b). The eastern indigo snake will use most of the habitat types available in its home range but prefers open undisturbed areas (Kuntz 1977).

Restricted range and declining numbers of gopher tortoises may be factors in the eastern indigo snake decline. In extreme South Florida (the Everglades and Florida Keys), eastern indigo snakes are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats (Steiner *et al*. 1983). It is suspected that they prefer hammocks and pine forests, since most observations occur there and use of these areas is disproportionate compared to the relatively small total area of these habitats (Steiner *et al*. 1983). Little is known of the minimum population size, range size or food requirements of the eastern indigo snake to determine what is essential to its continued existence (FWS 1999). Management towards maintaining and enhancing the diversity of plants and animals will directly benefit the eastern indigo snake and other species as well (FWS 1999). Continued protection of the gopher tortoise whose burrows may be necessary to indigo survival, will also benefit the snake (Hendry, Goodwin, Labinsky 1982). Critical habitat is not currently designated for the eastern indigo snake at this time. No adverse effects are anticipated to occur to the eastern indigo snake habitat as a result of the construction of the C-8 and C-9 Section 1135 Environmental Restoration Projects.

The endangered West Indian manatee is recognized by its massive walrus-like body that often weighs up to 2,000 pounds and can be 13 feet long (Hendry, Goodwin, Labinsky 1982). The gentle, slow moving creature is found throughout the southeast United States in connecting inland

rivers, estuarine and intracoastal waterways. Seasonal distribution of the manatee is affected by water temperatures below 20 degrees C that induces cold-stress and mortality (FWS 1999). In Florida, the manatee can be found on the Florida/ Georgia border south to Biscayne Bay over to Wakulla River south to Cape Sable (Hartman 1974, Powell and Rathbun 1984). In South Florida, manatees are most prominent year-round in the Indian River, Biscayne Bay, Everglades, Ten Thousand Islands, Estero Bay and Caloosahatchee River with winter aggregations as large as 50 or more (FWS 1999). The West Indian manatee was first listed as endangered in 1967.

The manatee depends on natural freshwater sources and eats a variety of submergent, emergent, and floating vegetation. Quiet water bodies provide refugia for feeding, resting, cavorting, mating and calving. Deeper channels provide migration routes (Kinnaird 1983). The manatee has no natural predators and is susceptible to similar natural and human disturbances such as water quality degradation, loss of habitat, disease and natural catastrophes (FWS 1999). Continued efforts by the FWS to reduce manatee kill numbers attributed to poaching, net entanglement, and vandalism has resulted in declines from 8.3 percent to 2.6 percent in 1992 (Ackerman et al 1995). The manatee population is near 3,300 in Florida (FWS 2001).

The endangered West Indian manatee may occur within the proposed project area despite gated water control structures S-29 to the east and S-30 to the west on C-9 and S-28 to the east on C-8. Two manatee deaths have been reported approximately two miles downstream (eastward) of the project area (Fish & Wildlife Conservation Commission, 1974-Sept. 2000 Reported Manatee Deaths). Watercraft mortality data obtained from FMRI indicate that manatees are able to navigate upstream from the control structures on both C-8 and C-9 canals. No critical habitat for the manatee has been designated within the proposed project area.

5. EFFORTS TO ELIMINATE POTENTIAL IMPACTS:

Efforts to eliminate or significantly reduce the potential impacts associated with the environmental restoration projects will be addressed by implementing the following actions:

A. Construction activities will be kept under surveillance, management and control to minimize interferences with disturbances to, or damage to wildlife resources. Prior to the commencement of construction activities, the contractor will instruct all personnel associated with the project on which endangered species may be in the area, and the civil and criminal penalties for harming, harassing, or killing them.

B. Precautions will be taken during construction activities to insure the safety of the manatee. To insure the contractor and his personnel are aware of the potential presence of the manatee in the project area, their endangered status, and the need for precautionary measures, the contract specifications will include the standard protection clauses concerning manatees. All small vessels associated with the project will be required to operate at “no wake/idle” speeds at all times while in water where draft of the vessel provides less than 3-foot clearance from the bottom. Boats used to transport personnel shall be shallow draft vessels, preferably of the light-displacement category, where navigational safety permits. Vessels transporting personnel between the landing and any workboat shall follow routes of deep water to the extent possible. The contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of construction of the project.

C. Construction access and staging areas along the project will be identified in the contract plans and specification. Contractor vehicles, construction equipment and storage facilities will be required to stay within the identified construction areas.

D. Turbidity barriers will be installed by the contractor prior to undertaking any littoral shelf excavation work to maintain water quality standards. Turbidity barriers shall be made of material that manatees cannot become entangled, will be properly secured and will be regularly maintained to avoid manatee entrapment. Barriers shall be positioned not to block manatee access through the canal. If a manatee is sited within the work area all turbidity containment structure work will cease until the manatee passes by.

6. DETERMINATION OF EFFECT:

The finding or determination is the conclusion of the biological assessment and indicates the overall effect of the proposed activity to listed species and or their critical habitat.

A. The frequency of federally listed threatened and endangered species nesting along the approximately 3.1 miles of canal project ROW in the north Miami-Dade County is low if at all. No federally listed threatened and endangered species nesting has been documented within the proposed project area. Manatee sightings have not been recorded within the proposed project areas although manatee deaths have been reported 2 miles east of the C-9 proposed project area. No critical habitat is designated within the proposed project area.

B. No adverse, direct, indirect or cumulative affects are anticipated to federally listed threatened or endangered species by the construction of the proposed C-8 and C-9, Section 1135, Environmental Restoration Projects. The proposed projects components may beneficially affect the overall project area by improving wildlife habitat and water quality. The littoral shelves may provide a diverse breeding, nesting and hatching habitat for many animals in the South Florida area. The proposed projects may provide an increased food source for littoral feeding animals. These littoral shelves could increase habitat for federally listed threatened and endangered species as well as many other animals within the proposed project area. The proposed ancillary recreation component, a paved multi-purpose trail adjacent to the littoral shelves with interpretive signage, may help to educate trail users of the local environment and actions taken to restore habitat.

C. No adverse, direct, indirect or cumulative affects are anticipated to federally listed plant species. The nature and maintenance of the habitats along the canals makes it highly unlikely any federally listed plant species would be present. None of the listed plant species were apparent during the site visits.

REFERENCES

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APPENDIX XII
THREATENED & ENDANGERED SPECIES
PROTECTION MEASURES

STANDARD MANATEE PROTECTION CONSTRUCTION CONDITIONS FOR AQUATIC-RELATED ACTIVITIES

The permittee/grantee/lessee shall ensure that:

1. The contractor instructs all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel are responsible for observing water-related activities for the presence of manatee(s), and shall implement appropriate precautions to ensure protection of the manatee(s).

2. All construction personnel are advised that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and the Florida Manatee Sanctuary Act. The permittee and/or contractor may be held responsible for any manatee harmed, harassed, or killed as a result of construction activities.

3. Prior to commencement of construction, the prime contractor involved in the construction activities shall construct and display at least two temporary signs (placard) concerning manatees. For all vessels, a temporary sign (at least 8½" x 11") reading "Manatee Habitat/Idle Speed In Construction Area" will be placed in a prominent location visible to employees operating the vessels. In the absence of a vessel, a temporary sign (at least 2' x 2') reading "Warning: Manatee Habitat" will be posted in a location prominently visible to land-based, water-related construction crews.

A second temporary sign (at least 8½" x 11") reading "Warning, Manatee Habitat: Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment. Any collision with and/or injury to a manatee shall be reported immediately to the Florida Marine Patrol at 1-888-404-FWCC" will be located prominently adjacent to the displayed issued construction permit. Temporary notices are to be removed by the permittee upon completion of construction.

4. Siltation barriers are properly secured so that manatees cannot become entangled, and are monitored at least daily to avoid manatee entrapment. Barriers must not block manatee entry to or exit from essential habitat.

5. All vessels associated with the project operate at "idle speed/no wake" at all times while in the construction area and while in waters where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water, whenever possible.

6. If manatees are seen within 100 yards of the active daily construction/dredging operation, all appropriate precautions shall be implemented to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet of a manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment.

7. Any collision with and/or injury to a manatee shall be reported immediately to the Florida Marine Patrol (1-888-404-FWCC) and to the Florida Fish and Wildlife Conservation Commission, Protected Species Management at (850) 922-4330.

8. The contractor maintains a log detailing sightings, collisions, or injuries to manatees should they occur during the contract period. A report summarizing incidents and sightings shall

be submitted to the Florida Fish and Wildlife Conservation Commission, Protected Species Management, 620 South Meridian Street, Tallahassee, Florida 32399, and to the U.S. Fish and Wildlife Service, 6620 Southpoint Drive South # 310, Jacksonville, Florida 32216-0912. This report must be submitted annually or following the completion of the project, if the contract period is less than a year.

STANDARD PROTECTION MEASURES FOR THE EASTERN INDIGO SNAKE

1. An eastern indigo snake protection/education plan shall be developed by the applicant or requester for all construction personnel to follow. The plan shall be provided to the Service for review and approval at least 30 days prior to any clearing activities. The educational materials for the plan may consist of a combination of posters, videos, pamphlets, and lectures (*e.g.*, an observer trained to identify eastern indigo snakes could use the protection/education plan to instruct construction personnel before any clearing activities occur). Informational signs should be posted throughout the construction site and along any proposed access road to contain the following information:

a. a description of the eastern indigo snake, its habits, and protection under Federal Law;
b. instructions not to injure, harm, harass or kill this species;
c. directions to cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site on its own before resuming clearing; and,
d. telephone numbers of pertinent agencies to be contacted if a dead eastern indigo snake is encountered. The dead specimen should be thoroughly soaked in water, then frozen.

2. If not currently authorized through an Incidental Take Statement in association with a Biological Opinion, only individuals who have been either authorized by a section 10(a)(1)(A) permit issued by the Service, or by the State of Florida through the Florida Fish and Wildlife Conservation Commission for such activities, are permitted to come in contact with or relocate an eastern indigo snake.

3. If necessary, eastern indigo snakes shall be held in captivity only long enough to transport them to a release site; at no time shall two snakes be kept in the same container during transportation.

4. An eastern indigo snake monitoring report must be submitted to the appropriate Florida Field Office within 60 days of the conclusion of clearing phases. The report should be submitted whether or not eastern indigo snakes are observed. The report should contain the following information:

a. any sightings of eastern indigo snakes;

b. summaries of any relocated snakes if relocation was approved for the project (*e.g.*, locations of where and when they were found and relocated);

c. other obligations required by the Florida Fish and Wildlife Conservation Commission, as stipulated in the permit.